ENCLOSURE 2

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	50-313; 50-368
License Nos.:	DPR-51; NPF-6
Report No.:	50-313/98-01; 50-368/98-01
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Junction of Hwy. 64W and Hwy. 333 South Russellville, Arkansas
Dates:	January 26 to 30, with in office inspection until March 30, 1998
Team Leader:	P. Gage, Senior Reactor Inspector, Maintenance Branch
Inspectors:	P. Balmain, Operations Engineer, Office of Nuclear Reactor Regulation L. Ellershaw, Senior Reactor Inspector, Maintenance Branch C. Johnson, Senior Reactor Inspector, Maintenance Branch J. Kramer, Resident Inspector, Projects Branch F W. McNeill, Reactor Inspector, Maintenance Branch C. Paulk, Senior Reactor Inspector, Maintenance Branch J. Whittemore, Senior Reactor Inspector, Maintenance Branch
Accompanying Personnel:	R. Latta, Senior Operations Engineer, Office of Nuclear Reactor Regulation Dr. S. Wong, Probabilistic Risk Assessment Consultant, Brookhaven National Laboratory R. Deem, Probabilistic Risk Assessment Consultant, Brookhaven National Laboratory
Approved By:	Dr. Dale A. Powers, Chief, Maintenance Branch Division of Reactor Safety

ATTACHMENTS:

Attachment 1:	Supplemental Information
Attachment 2	Licensee-Provided Supplemental Information

EXECUTIVE SUMMARY

Arkansas Nuclear One, Units 1 and 2
NRC Inspection Report 50-313/98-01; 50-368/98-01

Arkansas Nuclear One personnel developed and implemented a program in accordance with 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," with some exceptions noted.

Supplemental information was provided to the team on February 18, 1998. This information is included as Attachment 2.

Operations

- Senior reactor operators, operations shift superintendents, and planning and scheduling senior reactor operators clearly understood the philosophy of the Maintenance Rule and their specific responsibilities regarding the Maintenance Rule program implementation (Section O4.1).

Maintenance

- Inconsistent management oversight and implementation of the Maintenance Rule program contributed to a scoping violation (turbine building sump) of 10 CFR 50.65(b) (Section M1.1).

- Two systems (i.e., emergency lighting and communications) were examples of a noncited violation of 10 CFR 50.65(b) scoping requirements (Section M1.1).

- The licensee's overall approach to performing risk ranking of structures, systems, and components for the Maintenance Rule program was adequate and their performance criteria for reliability and unavailability of structures, systems, and components were commensurate with assumptions in the probabilistic risk assessment. The significant involvement of probabilistic risk assessment personnel in expert panel deliberations was a strength (Section M1.2).

- The licensee's method of balancing reliability and availability provided a reasonable approach; however, a violation of 10 CFR 50.65(a)(3) was identified for the licensee's failure to demonstrate the balance of reliability and availability for a Unit 1 periodic assessment (Sections M1.3 and M1.4).

- The use of the two-dimensional risk matrix for online risk assessments had limited effectiveness for evaluating risk associated with removing equipment from service (Section M1.5).

- A violation of 10 CFR 50.65(a)(2) was identified for the licensee's failure to identify a functional failure of a swing charger during a surveillance test, which in combination with two previously identified failures, allowed the licensee to exceed the 125 Vdc system's reliability performance criteria without providing an evaluation for establishing necessary goals to monitor the effectiveness of maintenance (Section M1.6).

- Four examples of a violation of 10 CFR 50.65(a)(2) were identified for the failure to establish adequate measures to demonstrate that the performance of structures, systems, and components were effectively controlled by the licensee's preventive maintenance efforts (Sections M1.3 and M1.6).

- A violation of 10 CFR 50.65(a)(1) was identified for the licensee's failure to establish adequate goals commensurate with safety for the main steam safety valves (Section M1.6).

- The visual material condition of the plant equipment that was inspected was good based on system walkdowns (Section M2).

- Maintenance Rule self-assessment and surveillance reports were adequate in scope and the resultant corrective actions were appropriately addressed (Section M7.1).

<u>Engineering</u>

- System engineering supervisors manifested a strong understanding of the administrative controls related to the implementation of the Maintenance Rule. System engineers demonstrated a thorough understanding of the Maintenance Rule and their associated responsibilities (Section E4.1).

Report Details

Summary of Plant Status

During the onsite inspection week, Units 1 and 2 operated at or near full power.

According to licensee representatives, the Arkansas Nuclear One Generating Station had implemented a Maintenance Rule Program that endorsed the guidance of Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants."

I. Operations

O4 Operator Knowledge and Performance

O4.1 Operator Knowledge of the Maintenance Rule

a. Inspection Scope (62706)

During the inspection, the team interviewed a sample of facility operations personnel to determine if they were familiar with the general requirements of the Maintenance Rule, aware of probabilistic risk assessment insights, and understood their particular duties and responsibilities for Maintenance Rule program implementation. The six personnel interviewed were the operations shift superintendents, main control room supervisors from both plant units, a Unit 1 planning and scheduling liaison senior reactor operator responsible for work planning and scheduling, and a Unit 2 maintenance manager. All of the interviewed operations personnel held active senior reactor operator licenses.

b. Observations and Findings

The operator tasks associated with the Maintenance Rule included documenting structures, systems, and components (SSCs) that were out-of-service, evaluating priorities for restoration of SSCs to service, and evaluating plant configurations to determine if work authorization created unacceptable risk levels.

In general, the operators interviewed understood the philosophy of the Maintenance Rule, demonstrated a working knowledge of Maintenance Rule requirements, and understood their specific duties and responsibilities associated with implementation of the Maintenance Rule. All operators understood the need to restore equipment to operating condition and minimize SSCs unavailabilities.

During a review of the main control room logs, the team noted that log entries provided sufficient documentation to extract information on out-of-service times for inoperable plant equipment. The team noted very few instances of risk-significant SSCs having out-of-service times overlapping, which indicated that work scheduling and planning of equipment outages were adequately managed.

The plant risk matrix was a tool used by senior reactor operators on shift, and planning and scheduling liaison senior reactor operators to assess risk when removing equipment from service in each of the facility's units. The plant risk matrices were different between the units because of the different plant designs. The team interviewed the operations personnel, and planning and scheduling senior reactor operators to determine their familiarity with the use of the matrix, and their knowledge of the limitations of the matrix. Those persons interviewed understood the use of the risk matrix as defined by the planning and scheduling liaison guides for each unit. The personnel interviewed were aware that the matrix may not provide an accurate assessment of risk when more than two out-of-service SSCs were affected. In addition, the personnel interviewed were aware that removing items from service that were not on the matrix could impact plant risk. Currently, the licensee staff was planning for the implementation of personal computer-based probabilistic risk assessment software, the equipment out-of-service (EOOS) monitor program, for on-line risk assessment of concurrent equipment outages. The team determined that the use of this tool should enhance the process for evaluations of the risk impact of multiple SSCs being out-of-service within the same time period.

c. Conclusions

In general, the senior reactor operators, the operations shift superintendents, and planning and scheduling senior reactor operators interviewed clearly understood the philosophy of the Maintenance Rule and their specific responsibilities regarding the Maintenance Rule program's implementation. Operation's personnel were familiar with the Maintenance Rule procedures and the plant risk matrix. Additionally, plant personnel were aware of the limitations pertaining to the inability of the risk matrix to provide adequate information on risk impact of plant configurations with more than two out-of-service SSCs.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Scope of the Structure, System, and Component Functions Included Within the Maintenance Rule

a. Inspection Scope (62706)

Prior to the onsite inspection, the team reviewed Report 96-R-0003-01, "ANO Maintenance Rule Program," Revision 1; Attachment 6, "Maintenance Rule," Revision 8, to the System Engineering Desk Guide; the Updated Final Safety Analysis Reports for Arkansas Nuclear One Units 1 and 2; and emergency operating instructions. From this review, the team developed a list of SSCs and functions that were not included in the scope of the Maintenance Rule program, but may have been required to be in the scope in accordance with 10 CFR 50.65(b). During the onsite review, the team used this list to determine if all SSCs required to be in the scope of the licensee's Maintenance Rule program were appropriately identified.

b. Observations and Findings

The team identified that system engineers failed to include the Unit 2 turbine building sump in the scope of their Maintenance Rule program. The failure to include the turbine building sump in the scope of the Maintenance Rule was a concern because of the adverse effect imposed on a safety system (emergency feedwater) as a result of a potential failure of the turbine building sump. The team found that the omission of the turbine building sump system from the scope of the Maintenance Rule program was not indicative of a programmatic concern, but the omission did not meet the requirements of 10 CFR 50.65(b) and accordingly was a violation (50-313;-368/9801-01).

In response to the finding that the Unit 2 turbine building sump was not included in the scope of the Maintenance Rule program, the system engineer initiated Condition Report (CR)-C-98-0017. In this condition report, the system engineer stated that the turbine building sump should have been in the scope of the Maintenance Rule program due to backflow preventers that protect the emergency feedwater pump rooms from flooding and adversely effecting the associated safety systems. The licensee staff provided additional information, Attachment 2 of Enclosure 4, subsequent to the onsite inspection, which stated an intent to include the turbine building sump in the scope of the Maintenance Rule, to review drain systems of both units for similar adverse effects on safety systems, to develop the performance criteria and evaluate past performance for classification of the turbine building sump system. The team reviewed the additional information, and determined that the concern for adequate scoping of systems was addressed.

Licensee personnel identified the need to include the emergency lighting and communication systems in the scope of their Maintenance Rule program. These licensee-identified systems were added to the scope on April 15, 1997. The team found that corrective actions were taken by licensee personnel to address the specific self-identified examples. However, the corrective actions were not sufficient to identify the NRC identified issue. The team found this inadequacy to be related to a lack of management oversight of the Maintenance Rule program, allowing the individual system engineers and supervisors to make inconsistent Maintenance Rule decisions. The team found that the emergency lighting and communication systems were not indicative of a programmatic concern, and that adequate corrective actions were implemented to include these systems within the scope of the Maintenance Rule. The failure to include the emergency lighting and communications systems were examples of a violation of the requirements of 10 CFR 50.65(b) (50-313;-368/9801-02). This licensee-identified and corrected violation is being treated as a noncited violation, consistent with Section VII.B.1 of the NRC Enforcement Policy.

c. Conclusions

Inconsistent management oversight and implementation of the Maintenance Rule program contributed to a scoping violation (turbine building sump) of 10 CFR 50.65(b). Additionally, two systems (i.e., emergency lighting and communications) were examples of a noncited violation of 10 CFR 50.65(b) (Section M.1.1).

M1.2 Safety or Risk Determination

a. Inspection Scope (62706)

The team reviewed the methods and calculations that the licensee had established for making the required safety determinations, involving SSCs. The team also verified the adequacy of the methodology for the determination of the SSC's performance criteria. As part of the inspection team's review, expert panel members were interviewed and minutes of all panel meetings from January 1995 - December 1997 were reviewed. Finally, the team reviewed a sample of low safety-significant SSCs to assess if safety significance was adequately established.

b. Observations and Findings

b.1 Safety or Risk Determination Methodology

During the review of a sample of low safety-significant SSCs within the scope of the Maintenance Rule, the team found that the expert panel had properly determined the safety significance of those SSCs. The sample of SSCs included the auxiliary cooling water, control room ventilation, condensate, condensate storage and transfer, circulating water, 6.9 kVac switchgear, instrument air, intermediate cooling water, and integrated control systems in Unit 1. For Unit 2, the sample of SSCs included the auxiliary cooling water, condensate, circulating water, 6.9 kVac switchgear, instrument air, and intake structure ventilation systems. In general, the team found that the expert panel had properly categorized the safety significance of SSCs and documented the basis for their conclusions.

The expert panel determined the risk significance of SSCs based on the combined results from probabilistic risk assessment and deterministic considerations, using a consensus judgment decision-making process. Each unit's probabilistic risk assessment provided information on importance measures used for risk ranking of SSCs. The importance measures used were risk achievement worth, Fussell-Vesely importance measure, and cutsets contributing to 90 percent of core damage frequency. The importance measures used were consistent with industry guidance.

All sampled SSCs, with the exception of the instrument air system, were classified in the high safety-significant category by the expert panel. The evaluation of the risk significance for the instrument air system indicated only one cutset containing instrument air failures which met the 90 percent core damage frequency cutset criterion. Based on review of the design and probabilistic risk analysis modeling of the system, the expert panel classified the instrument air system in the low safety-significant category because of the availability of redundant air compressors, backup accumulators, and a cross-tie capability to the breathing air supplies. The team concluded that the expert panel's classification of the instrument air system in the low safety-significant category was reasonable.

The expert panel had declared systems required for containment response to be in the high safety-significant category. The containment response systems were the reactor building isolation, reactor building fan cooling, and reactor building spray systems for Unit 1, and the containment isolation, containment fan cooling, and containment spray systems for Unit 2. The high safety-significant classification of these systems indicated conservative judgments by the expert panel. The team did not identify any SSCs that had been improperly ranked.

The information used for risk ranking SSCs was based on the probabilistic risk assessment models developed to support Revision 1 of the individual plant examination studies submitted to the NRC. Generic failure data and plant-specific data for component failures and unavailabilities, as well as initiating event frequencies, were used in the probabilistic risk assessment calculations. At the time of the inspection, the licensee was updating the associated probabilistic risk assessment models and maintaining a living probabilistic risk assessment data base of basic event failure rates and unavailabilities in support of the future implementation of online probabilistic risk assessment tools such as the EOOS monitor and outage risk assessment management (ORAM) software. The living probabilistic risk analysis data bases were updated at each refueling cycle (18 months). The team observed that the cutsets generated from the 1993 probabilistic risk assessment models were the basis for Maintenance Rule evaluations.

The team found that a truncation level of 1E-9 was used to quantify the probabilistic risk assessment results used for risk ranking. This truncation limit was four orders of magnitude less than the overall core damage frequency estimates of 2.0E-5 per reactor-year for Unit 1, and 2.4E-5 per reactor-year for Unit 2. The team considered this limit to be reasonable to ensure risk-significant SSCs were not omitted from risk-ranking considerations. The team judged that the licensee's process was satisfactory to perform the risk ranking of SSCs within the scope of the Maintenance Rule.

b.2 Performance Criteria

The licensee's program used reliability performance criteria that counted functional failures at the system and train levels. Failures were assessed to determine if the system or train level functions were affected, but not if they were maintenance preventable. The licensee's methodology for establishing reliability performance criteria was presented in Attachment 7 of the System Engineering Desk Guide, Revision 8. The team noted that a cumulative probability curve and the expected failure distribution for an assumed (or calculated) SSC reliability value was used to establish a reliability performance criterion. The team observed that the mean failure rates for the failure probability distributions (e.g., binomial distribution for standby systems, and Poisson distribution for continuously operating systems) were based on a reasonable estimate of SSC demands and accumulated operational time over the monitoring interval of 36 months.

A 90 percent cumulative probability was chosen as the target threshold of poor performance due to an excessive number of functional failures. This value bounded the majority of the expected failures where the failure probability was approximately 10 percent or greater, and provided a margin beyond the mean number of expected failures. The team observed that the reliability criteria varied from one to four functional failures per two operating cycles (i.e., 36 months) at the system or train level for most of the risk-significant SSCs, depending on the probabilistic risk assessment assumed mean failure rates. The team noted that the licensee had performed sensitivity analyses to evaluate the impact on the plant core damage frequency value for use of actual reliability performance.data from the periodic assessment. The sensitivity analysis results showed that the increase in core damage frequency value was within it's allowable limit, per industry guidance, when the unreliability values for all risk-significant SSCs were set to the actual performance data obtained from the periodic assessment.

The system engineer established unavailability limits for risk-significant SSCs that would result in less than an allowable core damage frequency increase. The allowable increase in the core damage frequency value was estimated in accordance with industry guidance. The licensee's sensitivity analysis results showed that the increase in the core damage frequency value was within its allowable limit when the unavailabilities for all risk-significant SSCs were assumed to be at their performance criteria values obtained from the periodic assessment. The team also noted that the unavailability criteria for the risk-significant SSCs were based on a 12-month monitoring period, which was consistent with industry practice.

In general, the reliability and unavailability performance criteria for risk-significant SSCs appeared to be conservative with respect to probabilistic risk analysis assumptions. The team considered the licensee's approach to setting reliability and unavailability performance criteria was acceptable.

The team noted that a performance measure called the conditional probability [of success] was used as an additional performance criteria for selected risk-significant, standby SSCs (e.g., high pressure injection, low pressure injection, or emergency feedwater systems). The licensee's conditional probability [of success] model was defined as the product of the standby SSC availability, probability of start, and probability of run. While the concept of a conditional probability [of success] as a performance measure has merit, the team had questions regarding its applicability to the Maintenance Rule implementation as a measure for both reliability and availability. Another concern was the applicability of this conditional probability model for balancing reliability and availability of standby SSCs. These concerns are discussed below in Section M1.4.

b.3 <u>Expert Panel Observations</u>

The licensee's expert panels for Units 1 and 2 determined which SSCs were within the scope of the Maintenance Rule, evaluated the risk significance ranking, and established the performance criteria. Members of each unit's expert panel included representatives and designated alternates from system engineering (chairperson), operations, maintenance, and nuclear engineering design (whose representative was the probabilistic risk assessment engineer). The team noted that the expert panel members who did not have a strong probabilistic risk assessment background had received some probabilistic risk assessment training.

The team reviewed the licensee's process and procedures for establishing an expert panel for each unit. It was determined that the licensee had established the expert panels in accordance with the guidance provided in NUMARC 93-01. Attachment 6 of System Engineering Desk Guide, "Maintenance Rule," Revision 8, contained the guidance regarding expert panel activities and responsibilities. Joint meetings of each unit's expert panels were convened occasionally to address Maintenance Rule issues affecting both plant units. Based on interviews of panel members about previous decisions and aspects of panel responsibilities, the team determined that the expert panel members had an adequate working knowledge with respect to the Maintenance Rule implementation and that the participation of probabilistic risk assessment engineers provided strong input into the decision making on risk ranking and performance criteria of high safety-significant SSCs.

c. Conclusions

The team concluded that in general, the licensee's overall approach to performing risk ranking of SSCs for the Maintenance Rule program was adequate and their performance criteria for reliability and unavailability of SSCs were commensurate with assumptions in the probabilistic risk assessment. The team considered the significant involvement of probabilistic risk assessment personnel in expert panel deliberations a strength.

M1.3 Periodic Evaluation

a. Inspection Scope (62706)

The team reviewed the licensee's completed periodic assessments of the Maintenance Rule program (Unit 1 dated June 25, 1997, and Unit 2 dated January 6, 1998, which covered Unit 1 - Cycle 13 and Unit 2 - Cycle 12, respectively).

b. Observations and Findings

The team verified that the licensee's Maintenance Rule program established requirements to perform a periodic assessment at least once per refueling cycle. The current refueling cycle length assured that this will be performed at intervals of less than 24 months.

The team observed that licensee had implemented a unique approach to performing periodic assessments. Periodic assessments of each system were performed individually and then combined into one report with an attached summary. The Maintenance Rule program made extensive use of a Maintenance Rule data base over which control was distributed throughout the engineering supervisor level. The team observed that management oversight and expectations were informally established through a nonquality engineering report and a noncontrolled engineer's desktop guide with no clearly established responsibility for oversight of the overall program. The team observed a vulnerability for inconsistent quality of individual system assessments since no specific guidance was provided regarding the use of industry-wide operating experience or balancing unavailability and reliability. The inconsistent scope and detail indicated a nonuniform understanding of system engineer expectations for performing assessment in these areas.

The team noted that several SSCs that were classified as risk-significant did not have performance measures for availability established until December 9, 1997, when Report 96-R-0003-01 was revised. In Unit 1, the team found the lack of an availability performance measure for the following SSCs: the emergency feedwater initiation control system, the engineered safety features actuation system, the reactor building heating and ventilation system, the reactor building sumps, the reactor protection system, the traveling screens and screen wash system, and the 120 Vac instrumentation system. In Unit 2, the SSCs were: the 120 Vac instrumentation system, the component cooling water system, the core protection calculator, the chemical and volume control system, the fuel oil transfer system, the plant protection system, the reactor building heating and ventilation system, and the traveling screens and screen wash system. The team noted that when Report 96-R-0003-01 was revised, adequate performance measures were established for the above-listed SSCs with the exception of the Unit 1 and 2 traveling screens and screen wash systems, and the charging pumps (see Section M1.4) in the chemical and volume control system.

As a result of not establishing appropriate performance measures for availability of the risk-significant SSCs above, the periodic assessment for Unit 1, performed in June 1997, did not adequately demonstrate the balance of availability and reliability and was a violation of 10 CFR 50.65(a)(3) (50-313/9801-03). While the system engineers may have been monitoring the availability of those SSCs, there were no performance measures established for the system engineers to compare measured availability against. Without availability performance measures established, adequate balancing could not be performed.

Regarding the traveling screens and screen wash systems, the system engineers provided information that they considered the traveling screens' availability to be tracked under the service water systems. However, since one traveling screen on each unit could provide adequate flow to all the service water loops, any one screen in Unit 2 and any three screens in Unit 1 could be unavailable indefinitely without impacting the availability of the service water loops. Therefore, there was a potential that inadequate performance of the screens could be masked by the overall performance of the service water system.

The team noted that the system engineering desk guide addressed this condition by defining "masking." Section 4.12 states that certain systems have redundant components which can fulfill key system or train functions individually. "Masking" or "shadowing" occurs when one or more good performing redundant components are relied upon to satisfy the system or train function and poor performing components are masked.

The team found that the risk-significant traveling screen systems contained multiple 100 percent capacity screens that would not allow for the demonstration that the performance or condition of the traveling screens was being adequately controlled by appropriate preventive maintenance. This was because a poor performing screen, or inadequate, untimely preventive maintenance, would not be identified because availability was not being monitored. Additionally, without any availability performance measures, balancing of availability and reliability cannot be accomplished in accordance with 10 CFR 50.65(a)(3).

In the supplemental information related to the traveling screens (Attachment 2, Enclosure 1), licensee representatives provided information to augment the information provided to the team while onsite. In this enclosure, the licensee representatives restated the information provided to the team as documented above. The team noted that the primary argument appeared to be related to the modeling of the traveling screens as used in the probabilistic risk assessment. The team also noted that the presentation supported the team's concern with masking. The licensee representatives stated that all but one screen in either unit may be unavailable, but the service water system would still be considered available (i.e., masking poor performance of the screens).

The team also noted that the licensee representatives stated that the traveling screens were never taken out-of-service for preventive maintenance, which included the performance of meggar checks on the electric motors. While the licensee representatives did not explain what was intended by the statement that the traveling screens were still available during all preventive maintenance activities, the team found that in order to perform meggar checks on the motors, the motors must be de-energized, thus, immobilizing the traveling screens. The team considered the screens' inability to move to cause the screens to be unavailable. Additionally, other preventive maintenance activities could require the screen movement to be stopped (e.g., lubricating the motors).

The team considered the information provided in the supplemental response to be insufficient to demonstrate that the performance criteria, as documented during the inspection, was established in accordance with the requirements of the Maintenance Rule. The failure to have adequate measures established to demonstrate that the performance or condition of the traveling screens and screen wash system was being adequately controlled by the performance of appropriate preventive maintenance was identified as an example of a violation of 10 CFR 50.65(a)(2) (50-313, 368/9801-04).

c. <u>Conclusions</u>

The team identified one example of a violation of 10 CFR 50.65(a)(3) where the licensee failed to demonstrate the balance of reliability and availability for a Unit 1 periodic assessment. The team concluded that the failure to establish adequate measures to demonstrate the performance or condition of the traveling screens and screen wash systems for both units was an example of a violation of 10 CFR 50.65(a)(2).

M1.4 Balancing Reliability and Availability

a. Inspection Scope (62706)

Paragraph (a)(3) of the Maintenance Rule requires that adjustments be made, where necessary, to assure that the objective of preventing failures through the performance of preventive maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance. The team reviewed the plans and procedures the licensee had established to ensure this evaluation was completed. The team also reviewed the results of recent balancing assessments.

b. Observations and Findings

The licensee's approach to balancing equipment reliability and availability was addressed in Section 6.8, Attachment 6 of the ANO System Engineering Desk Guide, Revision 8. This engineering desk guide provided specific instructions for system engineers on how to balance SSC reliability and availability during the Maintenance Rule evaluation processes. The team observed that balancing consisted of establishing goals and/or performance criteria for the appropriate SSCs and functions, and then monitoring the performance of the affected equipment. The team found that an implicit assumption was made that if appropriate goals and criteria were set and if such goals and criteria were met, then an appropriate balance between reliability and unavailability would be achieved. The team concluded that such an approach should provide a reasonable balance, provided that appropriate goals and performance criteria were always established.

The team reviewed the licensee's approach to balancing system reliability and availability for high safety-significant SSCs to achieve optimum conditions. The requirements for balancing reliability and availability were discussed in Engineering Report 96-R-0003-01, "ANO Maintenance Rule Program," Revision 1. The team noted that system engineers were responsible for collecting data and implementing the balancing process for high safety-significant SSCs during periodic evaluations. Additionally, system engineers were responsible for defining parameters to be monitored or trended, reviewing and analyzing performance trend data, and updating the trend graphs.

The team noted that availability was not monitored for some high safety-significant SSCs, specifically, the Unit 2 traveling screens and charging pumps, and the Unit 1 traveling screens. Since availability criteria for these SSCs were not established, balancing reliability and availability could not be achieved. As discussed in Section M1.2, the conditional probability [of success] was used as a performance criteria for some high safety-significant SSCs (e.g., Unit 2 charging pumps). The team questioned the use of the conditional probability [of success] as a performance criteria for balancing reliability and availability because of potential masking of the reliability variable by the availability variable. For example, reliability could increase due to improvements in design or environmental conditions, and availability could decrease due to scheduling more preventive maintenance, which counteracts the effects of increasing reliability in the conditional probability formula. Since the product combination of the reliability and availability measures into one measure had the potential to mask adverse trends in system performance, the applicability of the conditional probability measure for Maintenance Rule implementation needs further review. The team identified this issue as an inspection followup item (50-368/9801-05) for further NRC review.

c. Conclusions

The team concluded that the licensee's method of balancing reliability and availability provided a reasonable approach to meet the intent of Section (a)(3) of the Maintenance Rule. However, the use of the conditional probability [of success] had the potential to mask adverse trends in system performance because of the product combination of the reliability and availability measures into one measure. The team categorized the use conditional probability for additional performance criteria as an inspection followup item pending further review by the NRC.

M1.5 Plant Safety Assessments Before Taking Equipment Out-of-Service

a. Inspection Scope (62706)

The team reviewed the licensee's procedures and discussed the process with applicable licensee personnel for assessing the change in overall risk associated with the removal of equipment from service due to failure or to support maintenance activities. Applicable licensee personnel included a probabilistic risk assessment representative, plant operators, operations management, and planning and scheduling liaison senior reactor operators. A sample of plant configuration changes that resulted from schedule changes and equipment failures was identified and then reviewed to evaluate the licensee assessments of the changes in risk that resulted from the configuration changes.

b. Observations and Findings

The licensee's process for removing equipment from service at power was documented in Entergy Operations Company Policy PL-130, "Online Maintenance Philosophy," Revision 0, Unit 1 Operations Planning and Scheduling Liaison Desk Guide, and Unit 2 Operations Planning and Scheduling Liaison Desk Guide.

During power operation of each unit, a two-dimensional risk matrix was used by planning and scheduling senior reactor operators to evaluate plant risk for single and double equipment outages. The team found that a traditional 84-day (or 12-week) rolling schedule was used for planning surveillance and preventive maintenance of plant equipment. The planning and scheduling senior reactor operators stated that the risk matrix was used to prevent planned concurrent equipment outages, which would place the plant in a high risk situation. The risk matrix was also used for evaluating emergent work needs resulting from unanticipated equipment failures.

The team noted that the two-dimensional matrix would not provide adequate guidance for assessing true plant risk when three or more SSCs were affected at the same time. The team observed that combinations of multiple, low risk-significant SSCs removed from service could place the plant in a risk-significant configuration. Additionally, the matrix did not explicitly address the risk impact of switchyard maintenance and system interdependencies on SSCs being taken out of service. The team understood that for combinations of equipment outages not considered in the matrix, the cognizant probabilistic risk assessment engineers in the nuclear engineering design department were contacted to perform detailed risk evaluations.

The team considered the use of the two-dimensional risk matrix for online risk assessments as having limited effectiveness. At the present time, the licensee staff was planning for the implementation of personal computer-based software for online risk assessment of concurrent equipment outages and; therefore, the issues concerning the use of the risk matrix would become inconsequential. The team considered the implementation of this tool should enhance the evaluations of risk impact of multiple SSCs being out-of-service at the same time.

Shutdown risk was managed through the use of the Outage Risk Management Guidelines, Unit 1 Shutdown Operations Protection Plan, Revision 4, and Unit 2 Shutdown Operations Protection Plan, Revision 1. The outage management group used the Electric Power Research Institute Outage Risk Assessment and Management software for evaluating defense-in-depth requirements to maintain the respective shutdown safety functions (e.g., decay heat removal, vital ac and dc power). Insights from the outage risk assessments were evaluated by the outage management division. The team noted that the probabilistic risk assessment group was involved in the risk assessment of the planned outage activities to evaluate risk significance of the activities and potential compensatory measures. The team found that this approach was acceptable and consistent with that used at other nuclear power plant sites.

c. Conclusions

The team concluded that the use of the two-dimensional risk matrix for online risk assessments had limited effectiveness for evaluating risk associated with removing equipment from service. Additionally, the team concluded that the users of the matrix were aware of its limitations for risk assessment of various equipment-outage configurations.

M1.6 Goal Setting and Monitoring and Preventive Maintenance

a. Inspection Scope (62706)

The team reviewed program documents and records in order to evaluate the process that had been established to set goals and monitor under Section (a)(1) and to verify that preventive maintenance was effective under Section (a)(2) of the Maintenance Rule. The team also discussed the program with the Maintenance Rule coordinator, system engineers, plant operators, and schedulers.

The team reviewed in detail the systems described below to verify: (1) that goals or performance criteria were established with safety taken into consideration, (2) that industry-wide operating experience was considered where practical, (3) that appropriate monitoring and trending were being performed, (4) and that corrective action was taken when a SSC function failed to meet its goal or performance criteria or when an SSC function experienced a maintenance preventable functional failure.

Unit 1	Instrument Air System
Unit 1	Low Pressure Injection System
Unit 1	**4.16 kV Switchgear System**
Unit 1	Control Rod Drive System
Unit 1	**Emergency Feedwater Initiation and Control System**
Unit 1	Integrated Control System
Unit 1	**Process Radiation Monitoring System**
Unit 1	Reactor Protection System
Unit 1	120 Vac Instrumentation System
Unit 2	6.9 kV Switchgear System
Unit 2	Feedwater Control System
Unit 2	Core Protection Calculator & Control Element Assembly Calculator
Unit 2	**Service Water System**
Unit 2	**Containment Spray System**
Unit 2	**Auxiliary Building Heating Ventilation & Air Conditioning System**
Unit 2	480 Vac System
Unit 2	125 Vdc System
Unit 2	**Main Steam System**
Unit 1 & 2	Post Accident Sampling System
Unit 1 & 2	Structures
Unit 1 & 2	Control Room Ventilation System
Unit 1 & 2	Containment Isolation System

(Bold systems indicate Category (a)(1) monitoring)

b. Observations and Findings

Post Accident Sampling System (Unit 1 and Unit 2)

This safety-related system was in the scope of each unit's Maintenance Rule program. The functions that placed the systems in the scope (containment isolation and reactor coolant system pressure boundary integrity) were being monitored in the reactor building/containment structures and reactor coolant systems. The team noted only one component that was monitored for the Maintenance Rule. The system engineer had established performance measures for this component, Relay 94/8337-2, at less than three functional failures per two cycles and no repeat functional failures.

As documented in the periodic assessment issued January 6, 1998, the licensee concluded that the performance or condition of the post accident sampling system was being adequately controlled through the performance of appropriate preventive maintenance. The team found that these measures were not adequate because the relay was only actuated once each cycle for surveillance testing of sampling valves and, therefore, impossible to exceed two failures within two cycles. While the system engineer and his supervisor stated that any second functional failure would be considered repetitive, the existing guidance as documented in Report 96-R-0003-01 or the system engineering desk guide would not necessitate the second functional failure to be classified as a repeat failure. As documented in Enclosure 9 of Attachment 2, the licensee agreed with the team's finding and issued a condition report with appropriate corrective actions planned.

The team identified the failure to establish adequate performance measures to monitor the post accident sampling system as an example of a violation of 10 CFR 50.65(a)(2) (50-313;-368/9801-04).

Process Radiation Monitoring System (Unit 1)

The process radiation monitoring system was classified as low-risk significant. The system consists of two nitrogen-16 radiation monitors, two main steam line high-range radiation monitors, and a main condenser offgas radiation monitor. The function of this system is to provide control room operators with indications of a steam generator tube leakage. The operation of this system is discussed in the emergency operating procedures. The team noted that all the radiation monitors operate continuously and their performance is appropriately measured using reliability criteria. The system has been monitored under Category (a)(1) since the Maintenance Rule became effective because of several instrument drift-related failures of the nitrogen-16 radiation monitors and detector failures in the main steam line high-range radiation monitors. The licensee has completed short-term corrective actions to resolve the cause of the failures (revised nitrogen-16 monitor calibration procedure, installed plant modification to add additional more sophisticated nitrogen-16 monitors and instituted an 18-month periodic replacement of main steam line high-range detectors).

The team concluded that the licensee's corrective actions were appropriate to address radiation monitor failures. Goals and monitoring, which the licensee established to monitor the performance of the process radiation monitoring system, were also found to be appropriate.

120 Vac Instrumentation System (Unit 1)

The team performed a limited inspection of the portion of this system, which interfaces with the process radiation monitoring system. The 120 Vac instrumentation system was classified as risk significant and was being monitored as a Category (a)(2) system. The team reviewed performance criteria established for the electrical fault isolation function, which prevents electrical faults in the non safety-related process radiation monitoring system from propagating into the safety-related 120 Vac instrumentation system.

The licensee established measures for the system to perform its isolation function consisted of a reliability performance criterion of no more than one functional failure of electrical breakers per two operating/refueling cycles. This performance measure applied to molded case-circuit breakers, which supply power to the process radiation monitoring system, since these breakers are the components which actually perform the electrical fault isolation function. During discussions with the licensee system engineer and engineering supervisor, the inspector observed that the licensee did not perform periodic testing or maintenance on the electrical fault isolation function. The team initially questioned the licensee's ability to effectively monitor the isolation function in the absence of periodic testing. A review of supplemental information provided by the licensee following the onsite inspection week demonstrated that failures of the isolation function would be readily detected and monitored.

The licensee's staff indicated that they had previously identified the lack of testing of Unit 1 molded-case circuit breakers (NRC Regulatory Commitment 1CAN099703) and had implemented actions to perform testing of the reactor building penetration breakers during the spring 1998 refueling outage. The team observed that the licensee had also planned to develop a program for the remaining safety-related breakers by the end of 1998.

Control Room Ventilation System (Unit 1 and Unit 2)

During the team's review of the Maintenance Rule data base, a system-unique document developed to identify all pertinent Maintenance Rule information, the team identified several anomalies between the Unit 1 and 2 control room ventilation system Maintenance Rule data base. Three of the Unit 1 system performance criteria specified less than three functional failures or inappropriate system actuations per two cycles, while the fourth system performance criterion specified no repeat failures per cycle. This was in contrast to the Unit 2 system performance criteria, which specified less than three functional failures per operating cycle and no repeat functional failures per two operating cycles. Further, the Unit 1 control room ventilation system data base stated that the Unit 2 control room ventilation system had been classified as a Category (a)(1) system due to the problems associated with the control room emergency chillers. However, the Unit 2 control room ventilation system data base showed the system to be classified as Category (a)(2).

The team evaluated Unit 2 control room ventilation system condition reports dating back to 1993, and was unable to find a basis for the statement in the Unit 1 control room ventilation system data base. Licensee personnel, when informed of these anomalies, conducted an evaluation. While the data base performance criteria were different, licensee personnel determined that either data base was technically adequate and capable of monitoring the effectiveness of maintenance. They further determined that the statement identifying the Unit 2 control room ventilation system as a Category (a)(1) classified system was erroneous. The statement was apparently caused by poor communications between Unit 1 and 2 system engineering personnel during preparation for implementation of the Maintenance Rule program. Licensee personnel agreed to make the performance criteria consistent because of the system similarities and to correct the erroneous statement in the Unit 1 control room ventilation system data base.

With the exception of the above noted anomalies, appropriate performance criteria had been established, and the control room ventilation system was properly classified as Category (a)(2). The team's identification of inconsistent performance criteria and an erroneous statement in the Unit 2 control room ventilation system data base, which had existed since at least July 1996, indicated a lack of attention to detail relative to the cognizant system engineers' review of pertinent Maintenance Rule data.

Main Steam System (Unit 2)

The main steam system was included in the scope of the Maintenance Rule because it is safety-related, risk significant, and can initiate a reactor trip. There are four system functions and six system performance criteria identified on the main steam Maintenance Rule data sheet. The team noted that the reliability and availability assumptions contained in the probabilistic risk assessment had been considered in development of the performance criteria. The probabilistic risk assessment did not address the functions on a train basis, but rather on a component basis; therefore, the Maintenance Rule functional failure criteria were based on the component level.

On March 28, 1996, licensee personnel initiated Condition Report CR-2-96-0081, which documented that the main steam system functional failure limits specified in two of the system performance criteria had been exceeded. One of the exceeded performance criteria pertained to the atmospheric dump valves and turbine bypass valves. This criterion limited functional failures to less than three functional failures of the atmospheric dump valves and turbine bypass valves to control steam pressure per operating cycle with no repetitive functional failures per two operating cycles. The other performance criterion dealt with the main steam safety valves. This criterion limited functional failures to less than four functional failures per operating cycle of the main steam safety valves to operate as required, or maintain their set points to within ± 5 percent. Exceeding these criteria demonstrated unacceptable overall system performance in maintaining key functions; therefore, the main steam system was placed in Category (a)(1) status.

The licensee developed corrective actions and goals to monitor the effectiveness of those actions to eventually restore the main steam system to Category (a)(2) status. The atmospheric dump valves and the turbine bypass valves were addressed in Corrective Action Item CA-008 (an attachment to the condition report). The monitoring period to satisfy reclassification of the atmospheric dump valves and the turbine bypass valves was set to end February 28, 1999. The team considered the corrective actions and current goals to be appropriate.

With respect to the main steam safety valves, Condition Report CR-2-95-0294 was initiated to document five main steam safety valves failing set point testing during Refueling Outage 2R11 (approximately November-December 1995). The condition report caused an extensive root cause analysis to be performed, and incorporated into Condition Report CR-2-96-0081, which was initiated to address historical failures and place the main steam system in Category (a)(1) status. Additionally, Condition Report CR-2-96-0081 established corrective actions and goals. The monitoring period to satisfy reclassification of the main steam safety valves was set to end June 1, 1997, after the completion of Refueling Outage 2R12.

During Refueling Outage 2R12 testing, the licensee documented that four main steam safety valves had failed to lift within ±3 percent of set point. The goal established in Corrective Action Item CA-001, an attachment to Condition Report CR-2-96-0081, was that all valves tested each outage would lift within ±3 percent of set point.

Licensee personnel informed the team that a technical specification change was in process, and was planned to be submitted to NRC in July 1998. Table 3.7-5 in Technical Specification 3.7.1.1, currently specifies lift set point tolerances of +1 percent, -3 percent. Licensee personnel informed the team that the technical specification change would make it consistent with the requirements stated in ASME/ANSI OM-1987 Code, Part 1, "Requirements for Inservice Performance Testing of Nuclear Power Plant Pressure Relief Devices," which allows a +3 percent tolerance above lift set point. This information was documented in Condition Report CR-2-97-0152.

The team also noted that Condition Report CR-2-97-0152 identified a corrective action that addressed a modification to the main steam safety valves. The modification dealt with replacement of the existing large flat seats with a new vendor-designed flex-disc arrangement. The licensee personnel believed that the large flat seats exhibited a tendency to leak following valve actuation. They also believed that this appeared to complicate testing and maintenance activities, and influenced several of the probable causes for the failures that occurred during Refueling Outage 2R12. The Unit 2 main steam system engineer informed the team that implementation of this modification was planned to start during Refueling Outage 2R13 (approximately January 1999). At that time, it was planned to modify 4 of the 10 main steam safety valves with the balance being modified during Refueling Outage 2R14 (approximately July 2000). Corrective Action Item 007, an attachment to Condition Report CR-2-97-0152, further stated that due to the failures experienced during Refueling Outage 2R12, new goals were established to move the main steam safety valves toward an acceptable level of performance over the monitoring period. It further stated that this transition to an acceptable level of performance was based on the flexi-disc modification over a period of two to three operating cycles. Corrective Action Item CA-007 identified the revised goals as follows:

Short-Term

- The main steam safety valves tested in Refueling Outage 2R13 will lift below +5 percent of set point.
- Less than four main steam safety valves will lift above +3 percent of set point.

Long-Term

- The main steam safety valves tested in Refueling Outage 2R14 will lift below +4 percent of set point.
- Less than three main steam safety valves will lift above +3 percent of set point.

10 CFR 50.65 (a)(1) requires performance monitoring of SSCs against licensee-established goals in a manner sufficient to provide reasonable assurance that SSCs are capable of fulfilling their intended functions. It further requires that the goals be established commensurate with safety. The licensee personnel stated that the addition of a goal which included an upper limit of 5 percent for one valve to be commensurate with safety. The team considered the licensee-established goals to be inadequate. The goals did not provide reasonable assurance that the main steam safety valves were capable of meeting their intended functions. Further, the effectiveness of the licensee's corrective action could not be currently monitored by the goals, in that implementation of the corrective action was not scheduled until January 1999. The team also noted that the goals exceeded both the current and proposed set point lift limit tolerances specified in Technical Specification 3.7.1.1, as well as the ASME/ANSI OM-1987 Code, Part 1. Further, both of the short-term goals and one of the long-term goals exceeded the system performance criteria identified in the main steam system Maintenance Rule data base. Therefore, by minimally achieving the established short and long term goals, it would appear that the existing system performance criteria could not be met. The establishment of inadequate goals for the Unit 2 main steam safety valves was a violation of 10 CFR 50.65 (a)(1) (50-368/9801-06).

Structures (Units 1 and 2)

The licensee's program for monitoring structures was described in Procedure CES-19, "Maintenance Rule Structural Monitoring at Arkansas Nuclear One," Revision 0. Program information was also found in Engineering Report 96-R-0003-02, "Structural Review of Maintenance Rule." Under the Maintenance Rule program for structures, the program also monitored the Maintenance Rule functions of the containment polar cranes and the containment penetration isolation valves. Containment isolation valve monitoring is discussed later in this report.

The program required that structures within the program scope undergo a Maintenance Rule program baseline inspection by civil/structural engineers to establish that the initial condition of the structures would adequately support the structure Maintenance Rule functions. This effort was completed with the exception of the Unit 1 reactor building, which was scheduled to be inspected during the next scheduled refueling outage. The team determined that the licensee's schedule and plans for this activity were acceptable.

The team reviewed a sample of structure Maintenance Rule baseline inspection records and identified that baseline inspections had been performed by civil/structural personnel on structures that were not in scope. Interviews of civil\structural engineering personnel revealed that they were unsure of which structures were actually in the program scope, and had inspected structures that were not in scope, e.g., the low-level radioactive waste storage and post-accident sampling buildings. Additional team review revealed that the fuel oil storage and transfer system underground vault was not listed in scope, but the program appropriately treated the structure as if it were in scope. These anomalies were pointed out to licensee personnel who agreed with the team that the present program did not clearly delineate which structures were in the scope.

The structures monitoring program was based on a baseline and periodic inspections by civil/structural personnel. The inspection guidance contained the normal attributes found in successful monitoring programs. The team followed up on the deficiencies identified during the baseline inspection of the service water intake structures (spalling concrete on exterior walls and defective roof coatings), and verified that corrective action was initiated and repair work was being scheduled. In addition to inspections by civil/structural personnel, systems engineers were required to observe the condition of structures during their periodic system walkdowns. Identified deficiencies were to be reported to the civil engineering group for resolution on a structures deficiency report form. The team verified through interviews that the system engineers were aware of their responsibility for monitoring the condition of structures and were appropriately using the report forms.

The structures programmatic performance criteria of acceptable, acceptable with deficiencies, and unacceptable provided an adequate mechanism for placing structures in Category (a)(1) or (a)(2). The structures monitoring performance criteria also conformed to the regulatory position described Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 2, Section C.1.5.

In summary, the licensee's Maintenance Rule program for monitoring the condition of structures was adequate. Although a minor problem with scoping documentation was identified, the team did not identify any instance where the licensee's program treated structure monitoring in a manner not intended by the Maintenance Rule.

<u>Containment Isolation System (Units 1 and 2)</u>

Unit 1 and 2 containment/reactor building isolation systems Maintenance Rule performance was monitored by the same system engineering personnel that monitored containment/reactor building structural performance. The individual valves were monitored for reliability by identifying functional failures. The functional failure limits were 12 per cycle and 13 per cycle for Units 1 and 2, respectively. These limits were supported by the probabilistic risk analysis assumptions for reliability. Functional failures were identified by evaluating the values obtained from the licensee's leak rate test program required by Appendix J to 10 CFR Part 50. The licensee's Appendix J program contained administrative leak rate limits for each valve tested. These limits typically ranged from 200 to 10,000 SCCM.

If the test program administrative limits were exceeded, the Appendix J program engineer would initiate a corrective action document to address the problem. This would necessitate the system engineers to evaluate the leakage to determine if a functional failure had occurred. However, the Appendix J administrative leakage limits were typically at least a full order of magnitude less than the Maintenance Rule quantifying threshold for identifying a functional failure.

The documentation reviewed by the team in preparation for the inspection indicated that the leak rate for identifying a functional failure of a valve was the Technical Specification limit of 0.75 L_a, which represented the Appendix J defined Type A or overall integrated containment testing leak rate limit. A smaller Technical Specification limit of 0.6 L_a represented the allowed Appendix J defined Types B and C testing leak rate limit for penetrations and valves, respectively. Depending on the Unit, L_a was defined as 20 percent (Unit 1) or 10 percent (Unit 2) of containment air-weight expressed as leakage per day. The team reviewed the Maintenance Rule data base, which indicated that a containment isolation valve leak rate functional failure, was 0.75 L_a. This value amounted to a leakage rate, possibly for a single valve, of at least 248,000 SCCM for Unit 1, and 122,000 SCCM for Unit 2. As noted above, these values were significantly higher than the licensee's Appendix J program administrative limits.

The team questioned licensee personnel about the adequacy of the testing performance threshold to identify functional failures of containment isolation valves. System engineering personnel stated that the data base was not accurate and provided a memorandum that was intended to reflect a new threshold value for evaluating containment isolation valve performance for functional failure. This electronic mail memorandum from the Unit 1 reactor building system engineer to several recipients, dated January 6, 1998, stated that the new performance evaluating threshold for both units was 0.6 L_a for all valves and 0.3 L_a for a single valve. Personnel stated that supervisory approval was previously obtained to change the threshold; however, there was no documented approval of the change to the performance criteria. The licensee changed the data base to reflect the change in performance criteria prior to the end of the inspection.

The team accepted the identified new performance criteria as adequate to monitor the effectiveness of maintenance on containment isolation valves. The team determined that the previous excessively high performance criteria would not have demonstrated that the performance or condition of containment isolation valves was being assured through the performance of appropriate preventive maintenance. This was identified as an example of a violation of 10 CFR 50.65(a)(2) (50-313;-368/9801-04).

Instrument Air System (Unit 1)

The instrument air system was a continuously operated, nonrisk-significant system in Category (a)(2) status and monitored on the plant level with a performance criteria of less than three plant trips or transients for two cycles. Another performance criterion was less than three functional failures per cycle of other Maintenance Rule systems caused by instrument air failures. The licensee's experience at the time of the inspection attributed no plant trips or failures of other systems to this system. Performance criteria for this system were reasonable and the monitoring appeared to measure the effectiveness of maintenance with the exception noted below.

The team found that, because of system redundancy, component problems would not typically result in functional failures. The team noted that the instrument air system consisted of four 100 percent capacity compressors with backup capability supplied by both the service air and the breathing air systems. In addition to the redundancy and backup systems, the two units can be cross-tied.

As a result of the robust system design features, condition reports on continuing problems with solder joint failures and the poor performance of new compressors were not considered functional failures and, therefore, not used to measure the effectiveness of maintenance. Additionally, Condition Report 1-93-0025 documented a leak downstream of Valve IA-540 on February 3, 1993; Condition Report 1-93-0130 documented an instrument air line failure downstream of Valve IA-180 on May 10, 1993; Condition Report 1-94-0253 documented that a supply line connection to Air Filter F-87 leaked on August 17, 1994; and Condition Report 1-95-0129 documented a leak of an elbow joint downstream of Valve IA-813 on July 1, 1995. The Maintenance Rule data sheet noted that these failures that could have resulted in a reactor trip were prevented by operator actions.

The team observed that some problems were identified regarding the new air compressors. Condition Report 1-95-0178 documented recurring problems being experienced with new Instrument Air Compressors C-28A & C-28B, specifically loss-of-auto-start capability. The licensee documented these recurring problems in Job Orders 921062, 917961, and 911732. The basis documented in the Maintenance Rule data base for the disposition of this condition report as a non-functional failure was that it did not cause a post-transient review (reactor trip).

These condition reports documented licensee-encountered maintenance problems. These problems were not evaluated as functional failures because plant trips had not occurred. The team considered the above condition reports as opportunities for the licensee to account for and measure the effectiveness of maintenance on the instrument air system.

125 Vdc Power (Unit 2)

The 125 Vdc system was a continuously operated, risk-significant system in Category (a)(2) status and monitored with reliability and unavailability performance criteria on the system, train, and component levels. Reliability performance criteria were: (1) no more than one functional failure of the control centers, battery banks, or the isolation function during any two cycles; (2) no more than two functional failures of battery chargers per cycle; (3) no more than three breaker functional failures of the system in one cycle; (4) no more than one functional failure of the penetration protection breaker per cycle; (5) no more than one reactor trip caused by the 125 Vdc system during three cycles; and (6) no repetitive functional failures in two cycles. The unavailability performance criterion during a cycle was less than 0.2 percent. The licensee staff had identified two functional failures of the battery eliminators (counted as battery chargers). Unavailability was 0.0 percent. Performance criteria for this system were reasonable and the monitoring appeared to measure the effectiveness of maintenance with the exception noted below.

The team found that the licensee failed to identify a functional failure as documented in Condition Report 2-97-0084. The condition report documented a surveillance failure when the swing charger would not maintain 125 V on March 13, 1997. The Maintenance Rule data base documented the basis for the disposition as a non-functional failure because the failure occurred while the swing charger was not in service. The team believed the licensee had no assurance that this failure would not have occurred when the charger was in service. The team observed that if this condition had been considered as a functional failure, the result when coupled with two previous functional failures, Condition Reports 2-97-0079 on March 10 and 2-97-0560 on October 19, 1997, would have exceeded the established performance criteria for the system, which would have required an evaluation as a candidate to be placed in Category (a)(1). The team identified this as a violation of 10 CFR 50.65(a)(2) (50-368/9801-07). Subsequent to the onsite inspection effort, licensee personnel initiated Condition Report 2-98-157 to capture the surveillance failure on March 13, 1997, as a functional failure and to perform the required evaluation of the 125 Vdc system for Category (a)(1) status.

<u>Core Protection Calculator (Unit 2)</u>

After having received Maintenance Rule training, the system engineer that had recently acquired the Maintenance Rule function of the core protection calculator system, recognized that several additional performance criteria were needed to effectively measure the systems performance. The team noted that on December 9, 1997, the system engineer appropriately revised the performance criteria, by appropriately adding seven performance criteria to the core protection calculator.

On January 28, 1998, the team identified that when the system engineer revised the performance criteria on December 9, 1997, the system engineer failed to evaluate the effectiveness of the new performance criteria for the monitoring period. The system engineer only applied the new criteria to future performance data and not historical data.

Therefore, the team identified that from July 10, 1996, through January 28, 1998, the licensee had failed to establish adequate measures to evaluate the appropriateness of the performance of preventive maintenance for the Unit 2 core protection calculator system. This was an example of a violation of 10 CFR 50.65(a)(2) (50-313;-368/9801-04).

After being questioned by the team about the appropriateness of only looking forward to evaluate performance criteria, the system engineer discussed the process with the appropriate engineering supervisor and recognized the need to review the monitoring period condition reports and job orders. On January 28, 1998, the system engineer performed the review and identified one functional failure of the core element assembly calculator whose performance criteria were monitored under the core protection calculator system; however, the failure did not change the current Category (a)(2) status of the system.

The system engineer identified that usage of an old revision of the System Engineer Desk Guide, which stated in Step 6.9.9 that, "When performance criteria is [sic] revised, it is only to apply the new criteria to future performance data. It is not necessary to apply the new criteria to historical performance." The team noted that the incorrect guidance to the system engineers in the System Engineer Desk Guide was corrected in Revision 8, which was issued on December 8, 1997.

c. Conclusions

The team identified three examples of a violation of 10 CFR 50.65(a)(2) for the failure to establish performance measures to demonstrate that the performance of SSCs was effectively controlled by the licensee's preventive maintenance efforts. These examples included the post-accident sampling system, containment isolation system, and the core protection calculator system.

A violation was identified for the licensee's failure to identify a functional failure within the 125 Vdc system, which when coupled with previous functional failures would have exceeded the established performance criteria for the system, and required an evaluation for placing the system in Category (a)(1).

The team identified one violation of 10 CFR 50.65(a)(1) in that the licensee failed to establish goals commensurate with safety for the main steam safety valves.

In general, the team concluded that functional failure determinations were conservative, and appropriate performance criteria established to monitor the effectiveness of maintenance for structures, systems, and components.

The team identified a violation of 10 CFR 50.65(a)(2) for the licensee's failure to identify a functional failure of a swing charger during a surveillance test, which in combination with two previously identified failures allowed the licensee to exceed the 125 Vdc system's reliability performance criteria without providing an evaluation for establishing necessary goals to monitor the effectiveness of maintenance.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope (62706)

In the course of verifying the implementation of the Maintenance Rule, the team performed in-plant walkdowns to examine the material condition of the following systems:

- Instrument air system (Unit 1)
- 4160 Vac system (Unit 1)
- Low pressure injection system (Unit 1)
- Integrated control system (Unit 1 processing and control cabinets)
- Process radiation monitoring system (Unit 1 N-16, main steam line, and condenser offgas monitors, and control room displays)
- Service water intake structures (Units 1 and 2)
- Main steam system (Unit 2)
- 125 Vdc system (Unit 2)
- Auxiliary building HVAC system (various Unit 2 switchgear and equipment room coolers)
- 480 Vac system (various Unit 2 load centers)
- Feedwater control system (Unit 2)
- 6.9 kVac switchgear (Unit 2)
- Core protection calculator and core element assembly calculator (Unit 2)

b. Observations and Findings

The team generally found that the systems inspected appeared to be free of corrosion, oil leaks, water leaks, trash, and appeared, based on their external condition, to be well maintained. In addition, supports, insulation, and coatings appeared acceptable.

A recently completed refurbishment program had resulted in excellent visual appearance of material condition on the interior of the Unit 1 service water intake structure. The interior of the Unit 2 structure was in need of the same refurbishment. Accessible fire seals, coatings, and component and piping supports were in excellent visual condition. Minor packing leakage on a jockey fire pump and an associated valve was identified and tagged.

The licensee was aware of all observations made by the team and was planning appropriate corrective action.

c. Conclusions

In general, the visual material condition of the plant equipment that was inspected was good based on system walkdowns.

M7 Quality Assurance in Maintenance Activities

M7.1 Licensee Self Assessment

a. Inspection Scope (62706)

The team reviewed all the self assessments and surveillance reports associated with the implementation of the Maintenance Rule from the inception of the program to the time of the inspection.

b. Observations and Findings

The licensee had conducted three assessments and two surveillances related to the implementation of the Maintenance Rule. These assessments and surveillances were adequate in scope and the recommendations were constructive in identifying areas for improvement. Based on the teams' review of the licensee's documented dispositions, the corrective actions resulting from these assessments and surveillance reports were appropriately addressed.

c. Conclusions

The team concluded that the Maintenance Rule self-assessments and surveillance reports were adequate in scope and the resultant corrective actions were appropriately addressed.

III. Engineering

E4 Engineering Staff Knowledge and Performance

E4.1 Engineers Knowledge of Maintenance Rule

a. Inspection Scope (62706)

The team interviewed engineering personnel to assess their understanding of the Maintenance Rule and associated responsibilities. The team also reviewed the training that had been administered to system engineering personnel.

b. Observations and Findings

The team interviewed a representative sample of system engineering supervisors. As a result of these discussions, the team determined that all of the supervisors interviewed demonstrated a strong understanding of the administrative controls contained in Engineering Report 96-R-0003-01, "Maintenance Rule Desk Guide," Attachment 6, Revision 1. Specifically, the system engineering supervisors were aware of the required approvals for changes to the Maintenance Rule program, as well as, the interface controls concerning the expert panel and the Maintenance Rule coordinator. Supervisory knowledge of oversight responsibilities and interface controls were effectively demonstrated with no discrepancies identified.

The team found the expert panel to consist of experienced supervisory-level staff who had met on an as-needed frequency. The panel's responsibility, pertaining to Maintenance Rule activities, primarily, addressed risk significant determinations for SSCs. The panel members indicated that both the system engineers and the expert panel members had been trained in probabilistic risk assessment and the Maintenance Rule. An expert in probabilistic risk assessment was included as a member of the panel.

All system engineers interviewed demonstrated an in-depth and sound knowledge of their respective systems. Although not having received formal training in probabilistic risk analysis, the system engineers understood the relationship, and bases, between it and the safety functions and performance criteria of their respective systems. The team noted that a strong reliance existed on the nuclear engineering design group for detailed probabilistic risk assessment support activities. The interviewed system engineers indicated that they had received approximately 12-15 hours of formal training on the Maintenance Rule.

The team identified that system engineering personnel had a significant responsibility associated with the Maintenance Rule activities. The system engineers developed performance criteria, established goals, performed evaluations, and made functional failure determinations for their systems. The system engineers knowledge and understanding of the Maintenance Rule were sufficient to perform the tasks required of them.

Civil/structural engineering personnel had a very limited knowledge of Maintenance Rule program requirements. However, their responsibility for conducting baseline and periodic inspections did not require program knowledge. Those system engineers interviewed by the team had sufficient knowledge to carry out their many program responsibilities related to performance criteria determination, performance monitoring, and evaluation for the identification of functional failures.

c. Conclusions

The team concluded that the system engineering supervisors had a strong understanding of the administrative controls related to the implementation of the Maintenance Rule. The system engineers demonstrated a thorough understanding of the Maintenance Rule and their associated responsibilities.

V. Management Meetings

X1 Exit Meeting Summary

The team discussed the progress of the inspection on a daily basis and presented the inspection results to members of licensee management at the conclusion of the inspection on January 30, 1998. At this meeting, a licensee representative questioned certain findings. Inoffice inspection continued until March 30, 1998, during which time the team addressed supplemental information provided following the onsite inspection. As a result, various questions were resolved. Consequently, a supplemental telephonic exit was held on March 30, 1998, to discuss the enforcement findings from the inspection. The licensee representatives acknowledged the findings presented.

The team asked the licensee staff and management whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

C. Anderson, Plant Manager, Unit 2
G. Ashley, Supervisor, Nuclear Safety
V. Bond, Supervisor, System Engineering, Unit 2
M. Chisum, Manager, System Engineering, Unit 2
D. Denton, Director, Support
P. Dietrich, Maintenance Manager, Unit 1
R. Edington, General Manager, Plant Operations
B. Greeson, Supervisor, System Engineering, Unit 2
R. Hutchinson, Vice President, Operations
B. James, Outage Manager, Unit 2
J. Kowalewski, Manager, System Engineering, Unit 1
R. Lane, Director, Design Engineering
J. McWilliams, Manager, Modifications
J. Miller, Manager, Nuclear Engineering Design
D. Mims, Director, Nuclear Safety
D. Nilus, System Engineering, Unit 2
D. Phillips, Supervisor, System Engineering, Unit 1
F. Philpott, Corporate Assessments
S. Pyle, Specialist, Licensing
E. Rogers, Project Manager, Corporate Headquarters
S. Rowe, Maintenance Rule Coordinator
C. Turk, Manager, Mechanical Civil Structural Engineering
J. Vandergrift, Director, Quality
D. Wagner, Supervisor, Quality Assurance
C. Zimmerman, Plant Manager, Unit 1

NRC

S. Burton, Resident Inspector
J. Melfi, Resident Inspector
D. Powers, Chief Maintenance Branch

INSPECTION PROCEDURES USED

IP 62706	Maintenance Rule

ITEMS OPENED

Opened

50-368/9801-01	NOV	Failure to include the turbine building sumps within the scope of the Maintenance Rule program
50-313;-368/9801-02	NCV	Failure to include the emergency lighting and communications systems within the scope of the Maintenance Rule program
50-313/9801-03	NOV	Inadequate balance for reliability and unavailability
50-313;-368/9801-04	NOV	Inadequate performance measures for SSCs
50-313;-368/9801-05	IFI	Use of conditional probability for balancing reliability and unavailability
50-313;-368/9801-06	NOV	Inadequate goals established for Unit 2's main steam safety valves
50-368/9801-07	NOV	Failure to identify functional failure and subsequently perform evaluation of 125 Vdc for Category (a)(1) status

ITEMS CLOSED

Closed

50-313;-368/9801-02	NCV	Failure to include the emergency lighting and communications systems within the scope of the Maintenance Rule program

PARTIAL LIST OF DOCUMENTS REVIEWED

Assessments:

Independent Assessment of Maintenance Rule Implementation at Arkansas Nuclear One, Units 1 and 2, June 18, 1996

EOI Maintenance Rule Implementation Assessment Report, June 19, 1996

Unit 1 - Cycle 13 Maintenance Rule Periodic Assessment, dated June 25, 1997

Unit 2 - Cycle 12 Maintenance Rule Periodic Assessment, dated January 6, 1998

Reports:

Engineering Report 96-R-0003-01, "ANO Maintenance Rule Program," Revision 1

Engineering Report 96-R-0003-01, "ANO Maintenance Rule Program," Revision 0

Engineering Report 96-R-0003-02, "Structural Review of Maintenance Rule"

Instrument Air Cycle 13 Performance Report, dated January 27, 1997

4160 VAC Power Distribution Cycle 13 Performance Report, dated January 17, 1997

DC Power System Cycle 12 Performance Report, dated November 17, 1997

Decay Heat System/LPI Cycle 13 Performance Report, dated January 17, 1997

ANO Maintenance Rule Implementation Report, November 3, 1997

Quality Assurance Surveillance Report SR-017-96, Maintenance Rule Implementation, August 29, 1996

Quality Assurance Surveillance Report SR-051-97, October 8, 1997

Miscellaneous:

CES-19, "Maintenance Rule Structural Monitoring at Arkansas Nuclear One," Revision 0

ANO System Engineering Desk Guide Attachment 6, "Maintenance Rule," Revision 6

ANO System Engineering Desk Guide Attachment 6, "Maintenance Rule," Revision 8

ANO System Engineering Desk Guide, Attachment 7, "Guidance for Establishing Technical Basis for Performance Criteria," Revision 8

Arkansas Nuclear One (ANO) Generating Station Unit 1 Individual Plant Examination (IPE), Revision 1, September 14, 1993

Arkansas Nuclear One (ANO) Generating Station Unit 2 Individual Plant Examination (IPE), Revision 1, March 19, 1993

Entergy Operations Company Policy PL-130, "Online Maintenance Philosophy," Revision 0

ANO Calculation 95-E-0063-01, "Equipment Out of Service Matrix," Revision 2

ANO Calculation 96-E-0067-01, "Maintenance Rule Bounding Unavailabilities," Revision 0

ANO Calculation 97-E-0216-01, "ANO-1 Maintenance Rule Assessment of 1R13 Periodic Assessment Data," Revision 0

Unit 1 Operations Planning and Scheduling Liaison Desk Guide, April 29, 1997

Unit 2 Operations Planning and Scheduling Liaison Desk Guide, November 11, 1996

ANO-1 Shutdown Operations Protection Plan, Revision 4

ANO-2 Shutdown Operations Protection Plan, Revision 1

Job Orders

00966808
00973770
00965456
00965941

Drawings

E-2008	Sheet 1	Revision 25
E-2014	Sheet 1	Revision 39
E-2014	Sheet 2	Revision 35
E-2014	Sheet 3	Revision 32
E-2014	Sheet 4	Revision 39
E-2015	Sheet 1	Revision 36
E-2015	Sheet 2	Revision 35
E-2015	Sheet 3	Revision 34
E-2015	Sheet 4	Revision 31

Condition Reports (common units)

C-93-0045	C-95-0129	C-95-0134

Condition Reports (Unit 1)

90-0554	93-0025	93-0130	93-0287	93-0477
94-0009	94-0078	94-0253	95-0053	95-0063
95-0099	95-0117	95-0120	95-0128	95-0129
95-0178	95-0205	95-0209	95-0225	95-0235
95-0262	95-0264	95-0287	95-0367	95-0444
95-0586	95-0636	96-0013	96-0030	96-0044
96-0065	96-0068	96-0102	96-0137	96-0147
96-0183	96-0227	96-0233	96-0259	96-0268
96-0335	96-0343	96-0365	96-0375	96-0379
96-0404	96-0480	96-0541	96-0571	96-0602
96-0615	96-0666	96-0679	97-0009	97-0045
97-0049	97-0068	97-0083	97-0099	97-0118
97-0135	97-0160	97-0175	97-0202	97-0239
97-0270	97-0333	98-0007	98-0030	98-0032
98-0033	98-0034			

Condition Reports (Unit 2)

93-0222	94-0080	94-0204	94-0207	95-0008	95-0051
95-0052	95-0077	95-0091	95-0094	95-0108	95-0120
95-0122	95-0136	95-0141	95-0167	95-0229	95-0254
95-0257	95-0275	95-0312	95-0339	95-0341	95-0344
95-0357	95-0363	95-0367	95-0392	95-0402	95-0447
95-0499	95-0550	96-0008	96-0049	96-0099	96-0103
96-0120	96-0122	96-0143	96-0144	96-0145	96-0148
96-0160	96-0167	96-0178	96-0180	96-0181	96-0186
96-0194	96-0195	96-0199	96-0230	96-0231	96-0255
96-0258	96-0261	96-0264	96-0267	96-0280	96-0297
96-0311	96-0312	96-0317	96-0329	96-0337	96-0347
96-0348	96-0357	96-0359	96-0374	96-0378	96-0385
96-0389	96-0403	96-0404	97-0013	97-0020	97-0027
97-0031	97-0046	97-0055	97-0057	97-0058	97-0069
97-0073	97-0079	97-0082	97-0084	97-0087	97-0091
97-0118	97-0131	97-0136	97-0150	97-0158	97-0165
97-0169	97-0170	97-0178	97-0180	97-0181	97-0189
97-0191	97-0197	97-0199	97-0203	97-0204	97-0212
97-0218	97-0245	97-0256	97-0257	97-0259	97-0260
97-0273	97-0277	97-0289	97-0294	97-0304	97-0317
97-0318	97-0324	97-0330	97-0336	97-0338	97-0349
97-0357	97-0361	97-0364	97-0365	97-0367	97-0371
97-0383	97-0399	97-0400	97-0441	97-0443	97-0444
97-0446	97-0453	97-0456	97-0491	97-0514	97-0556
97-0557	97-0560	97-0562	97-0578	97-0592	97-0601
97-0607	97-0609	97-0612	98-0001	98-0002	98-0003
98-0013	98-0014				

ATTACHMENT 2

Licensee-Provided Supplemental Information[1]

Enclosure 1	Traveling Screen Availability Monitoring
Enclosure 2	Maintenance Rule Functions of the Fuel Handling System
Enclosure 3	Turbine Building Crane Scoping
Enclosure 4	Unit 2 Turbine Building Sump Scoping
Enclosure 5	Performance Monitoring of CVCS Charging Pumps
Enclosure 6	Basis for Unit 2 Main Steam Safety Valve (a)(1) Goals
Enclosure 7	Unit 1 Instrument Air System
Enclosure 8	Molded Case Circuit Breaker Testing
Enclosure 9	Unit 2 PASS Performance Criteria
Enclosure 10	ANO Unit 1 Intake Structure
Enclosure 11	ANO-2 Service Water System
Enclosure 12	PSA System/Train Cutsets Run Failure Rates (24 hr Mission)

[1]Documents received on February 18, 1998, via Internet or facsimile from D. Nilius, Entergy, to P. Gage, NRC Region IV. The contents of the documents were not altered.

The submitted Question/Response states:

Discuss why availability is not monitored on Unit 1 and Unit 2 Traveling Screen system.

The ANO Unit 1 and Unit 2 design of the intake structure, and the functions that the systems perform, differ significantly. These differences have resulted in some level of dissimilarity between the Unit 1 and Unit 2 Traveling Screen (TS) System Maintenance Rule implementation. For this reason, the response to this question has been addressed separately for Unit 1 and Unit 2. The response for Unit 2 will be discussed first since it is generally more straight forward.

Unit 2:

The function of the traveling screens on Unit 2 is to support operation of Service Water. As shown in the attached drawing they are modeled in the PSA as part of the three trains of the service water system which includes all components that are required to supply water to the two independent loops. Each pump train consists of both traveling screens, sluice gate, pump, discharge check valve and pump strainer. The failure rate of the traveling screens is included in the failure rate of the pump train that was used to establish performance criteria as shown in the attached cutsets. As delineated on page 8 of the NRC Maintenance Rule Inspection Procedure, "The licensee should follow the conventions for defining trains and systems that were established in the plant safety analysis and the PRA". In addition, the traveling screens are described in the SAR under the service water system description. ANO-2 is using the PSA as the defining basis for modeling the traveling screens as part of the SW pump trains. Each of these pump trains is monitored for unavailability taking into account unavailability values from the PSA for the pump trains. As a result, the unavailability of the traveling screens that would not allow the screens to support operation of the service water system would be counted as unavailability of the respective pump trains. To model the traveling screens differently would require revising the PSA or not modeling them in accordance with the PSA.

Unit 1:

Description of System (sketch attached)

The traveling screen system consists of eight traveling screens supported by two screen wash pumps and associated strainers, valves, cross ties and piping, associated instrumentation for operation and control, power supplies, cables, relays and etc., up to and including the electrical breakers for each component.

The traveling screen system can logically be divided into two trains as related to the SW bays. Traveling screen system train "A" would include screens F-7C and F-7D and provides a suction source for SW Bay 'A' (normally supporting SW Loop 1). Traveling screen system train "B" would include screens F-7E and F-7F for SW Bay 'C' (normally supporting SW Loop 2). The PSA models complete fouling of all four of these traveling screens resulting in a complete loss of both service water loops, or in other words, the entire service water system. Therefore, although the PSA models the traveling screens at the system level and not at a train level; it was determined to be beneficial from a monitoring standpoint to subdivide the system into trains.

The remaining four traveling screens F-7A, F-7B, F-7G, and F-7H support circulating water pump operation and do not have a PSA function or risk significant function.

Maintenance Rule Function(s)

The traveling screen system performs three functions associated with the maintenance rule.

- The first function is to provide the lake water path for SW pump suction. The PSA models failure of this function at the system level as the fouling of all four traveling screens which are in the suction path to the "A" and "B" service water bays resulting in the loss of both loops of service water.
- The second function is to provide filtering of lake water to the service water pump suction to minimize the possibility of service water pump strainer fouling. The PSA models the traveling screen system at a level above this function, in that it assumes a loss of the entire SW system, not just a single train or loop.
- The third function is to provide water to the circulating water pumps suction in support of unit operation. This is not a PSA modeled function, however loss of this function could result in a turbine/reactor trip which makes it within the scope of the rule.

Originally Established Availability Criteria:

Availability of the risk significant traveling screens function is currently monitored under the service water system by the service water system engineer. The method of performing availability monitoring is described in the traveling screens technical basis document which states:

> "Removal of a single circulating water bay (including the two associated traveling screens) from service for planned maintenance does not typically result in service water loop in-operability. The service water bays are realigned to compensate for the one lake path being out of service. Traveling screen unavailability which would affect service water operation will be monitored by the service water system engineer as service water train unavailability."

Traveling Screen Maintenance

Preventative Maintenance

Traveling screens are not removed from service during preventative maintenance activities. Preventive maintenance is performed on the screens quarterly to inspect each screen basket for damage or deterioration to the mesh, frame and mounting hardware. The head shaft bearings and drive chain are lubricated. Inspections are performed on the gear box, coupling, drive chain, sprockets, spray header piping and nozzles. The drive motor for each screen is inspected, cleaned, lubricated and meggered on a 72 week interval. Since the screens are not removed from service, the traveling screens are available during preventative maintenance activities to perform their required risk significant functions.

Corrective Maintenance

Due to extensive fish runs in late 1996 and early 1997, the traveling screens system for Unit 1 failed to meet the established reliability performance criteria and was declared (a)(1). As a result of corrective action plans associated with these functional failures, complete overhaul and rebuild was performed in 1997 on six of the eight Unit 1 screens with the remaining two Unit 1 screens scheduled for Spring '98 and the two Unit 2 screens scheduled for Fall '98. Upgrades and improvements have been implemented in conjunction with these overhauls.

Upgrades to the traveling screens are as follows:

- Screen carrier chain upgraded with non-lube chain having 17-4 PH stainless pins, rollers, and bushings. Automatic (spring loaded) carrier chain tensioner installed versus manual chain slack adjustment.
- Degraded or worn sections of the screen frame structure were replaced. Frame hardware was changed to 18-8 stainless to reduce corrosion degradation. Screen frames in the service water paths have been coated with anti-foulant coating to prevent zebra mussel attachment.
- Screen spray headers are being changed from carbon steel to stainless steel. A second or auxiliary spray header is being added (6 of 8 completed to date) to each screen to provide additional spray capacity if needed during heavy load periods. Spray nozzles were increased from 8/header to 9/header to improve overlap and ensure complete washing of the basket surface.
- Head shaft bearings upgraded from bronze to roller bearing assembly. Foot-shaft bearings upgraded to a hardened alloy steel w/ shaft sleeve insert.
- Seal strips added to the frame assembly to minimize possibility of leakage through carrier chain area.
- A boot loading leg was added to the bottom of the screen frame to prevent debris from bypassing the screens at the base of the frame. This also keeps debris from the screen baskets until they have rolled to a vertical position, allowing them to effectively carry the debris upward to be removed.
- Screen baskets have been changed from carbon steel framed baskets to fiberglass. The fiberglass baskets avoid corrosion and zebra mussel attachment problems experienced with carbon steel frames.

<u>Traveling Screen Maintenance - continued</u>

Additional improvements were made during 1997 to the screen wash system to improve reliability and capacity.

This corrective maintenance was performed on-line during bay cleaning outages. A lake water path to the service water bays was maintained during this corrective maintenance/overhauls and the emergency cooling pond was also available. Aggressive efforts have been made to resolve the issues with the traveling screens system, and conservative functional failure calls have been made in regards to the maintenance rule program.

ANO Unit 1 Conclusion/Response

The risk significant functions for the traveling screen system is to supply water to the service water system. Although logically grouped as trains, any one of four traveling screens can supply adequate lake water any or all of the service water pumps. Preventative maintenance on the traveling screens does not result in removing the screens from service. The traveling screens are only removed from service to perform corrective maintenance. Failures which would result in removing the screens from service for corrective maintenance are evaluated against reliability based performance criteria previously established for the traveling screen system. Functional failures against reliability based traveling screen system performance criteria have resulted in the system being classified as maintenance rule (a)(1). Extensive corrective actions have been taken to improve system reliability.

Since the traveling screens are not removed from service for preventive maintenance, the traveling screens could have been potentially excluded from availability monitoring. However, an agreement was reached with the service water engineer to monitor traveling screen availability as an input to service water train unavailability. The service water availability monitoring was utilized to cover the risk significant functions for the traveling screen system. During periodic assessments, the traveling screen system engineer is able to utilize the availability monitoring data accumulated by the service water engineer to ensure that availability and reliability is balanced.

In response to the inspector's concerns, an enhancement was implemented to add performance criteria and monitoring of Unit 1 lake source paths availability. This criteria has been added to the Unit 1 Traveling Screen system and improves availability monitoring of the complete path from the lake to the service water sluice gates. The additional monitoring is beneficial in that any impact to lake availability resulting from traveling screen corrective maintenance, bay outages for zebra mussel cleaning, circulating water pump maintenance, and circulating water bay maintenance activities will be monitored. In addition, monitoring both paths (basically at a train level) results in a criteria is that is more predictive in nature and further ensures that masking and shadowing does not occur. The Traveling Screen system technical basis document and the maintenance rule data base has been updated to reflect the new performance criteria.

Maintenance Rule Functions of the Fuel Handling System

The only Maintenance Rule scoping criteria applicable to the Fuel Handling System (FHS) is 10CFR50.65 (b)(2)(ii) which states "nonsafety related structures, systems, or components whose failure could prevent safety-related structures, systems, and components from fulfilling their safety-related function" belong in the scope of the rule. In the case of the FHS, it is necessary to evaluate the safety related equipment/component subject to damage in the event of a FHS failure. Fuel, by its very nature is classified as safety related but, upon closer inspection, this "definition" is not always clearly applicable. For instance, the classic definition of safety related, as derived from 10CFR100 Appendix A, section III(c) and repeated in the Maintenance Rule itself is "Structures, systems and components ... necessary to assure:

- The integrity of the reactor coolant pressure boundary,
- The capability to shutdown the reactor and maintain it in a safe shutdown condition, or
- The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the guideline exposures of this part [10CFR100]"

In the analyses documented in the SARs of both units, it can be inferred that the complete failure of a single fuel assembly is insufficient to result in offsite doses approaching 10CFR100 limits. Furthermore, examination of supporting calculations indicate that the drop of a fuel assembly, even onto one or more target assemblies, will not result in failure of enough fuel rods to approach the inventory release of one assembly. Therefore, taken one at a time, fuel assemblies (outside of the core) are not necessarily safety related components or, more properly, should be considered as safety related equipment not in service. Obviously, unirradiated fuel would not meet the definition of safety related until such time as it was installed in the core. As a result, in the development of the safety related or "Q" list equipment for ANO, the FHS components were classified non-Q except for those components/structures of the system whose failure could result in unanalyzed or unquantifiable damage to multiple irradiated fuel assemblies. The distinction between the safety-related function of the FHS and its non-safety related functions is not a simple nor obvious one. The safety-related function of the refueling equipment is to maintain structural integrity (both operationally and in a seismic event) to prevent catastrophic failure of the major FHS structures onto irradiated fuel and possibly initiating a release exceeding analyzed limits. This function is applied to the bridges because their total weight exceeds that of a fuel assembly and the collapse of the bridges in either the spent fuel pool or the reactor vessel has not been analyzed to determine whether this event would result in initiating a release exceeding analyzed limits. Therefore, maintaining its structural integrity was conservatively declared a safety related function of the bridge.

Fuel assembly integrity is a very important operational, economic, and industrial safety concern and one that is given serious consideration in the design and execution of fuel handling. However, it was originally assumed, by licensing basis, that a fuel assembly would be dropped and damaged. Design features of the plant exist specifically for this event (e.g. water level and filtered ventilation). Because they mitigate design basis events, these features have functions which fall under the scope of the Maintenance Rule and are covered in the Spent Fuel Pool and HVAC systems. Furthermore, it is recognized that fuel, in service, has Maintenance Rule functions and these are monitored under the Reactor System. This monitoring and corrective action program would capture and address damage or degradation to fuel caused by any mechanism. Therefore, based upon the information provided above, it is ANO's position that the fuel movement actions performed by the refueling equipment are outside the scope of the Maintenance Rule.

It should be noted, however, that the system function which states "maintain structural integrity to protect safety related equipment" requires monitoring of the system's structural integrity. This monitoring is performed under the condition monitoring system for the fuel handling equipment which includes preventive maintenance and procedural activities. This condition monitoring is designed to detect deteriorating conditions which would lead to a failure of equipment that could result in a dropped fuel assembly or otherwise initiate a fuel handling accident. Preventive maintenance is periodically performed on the equipment and always performed prior to a refueling outage. The equipment is inspected at these times and an unsatisfactory or deteriorating condition would be documented at this time with a condition report. Additionally, the equipment is checked out prior to each usage per procedural requirements. The equipment is similarly inspected for unsatisfactory or deteriorating conditions at these times as well. Any conditions found that could lead to a dropped fuel assembly or fuel handling accident would be documented with a condition report. The condition monitoring system for the fuel handling system consists of these preventive maintenance functions and checkout and operating procedures. The inspections are predictive in nature in that the tight criteria placed on acceptable materiel condition will identify a condition before a failure of the component can occur.

TURBINE BUILDING CRANE SCOPING

A scoping question arose concerning the use of the turbine building crane with the Dry Fuel Storage Project. Should the lifting and transferring of the Multi-assembly Storage Basket (MSB) be a system function of the turbine building cranes?

The Turbine Building Cranes were under the scope of the Maintenance Rule under the Turbine Building System due to the potential of being a trip initiator. This function includes transporting of the MSB in the Turbine Building and addresses the plant trip potential.

Any failures which impact the MSB pressure boundary are covered under the Dry Fuel Storage System Maintenance Rule criteria. The Dry Fuel Storage Project utilizes many permanent plant systems and equipment to load, transfer, and store the irradiated fuel. Most of this equipment is not part of the Dry Fuel Storage System, but if any of these systems or equipment failed causing damage or failure of the Dry Fuel Storage equipment, it would be documented as a functional failure of the Dry Fuel Storage System which is under scope of the Maintenance Rule. The function of lifting and transferring of the MSB is covered under the Maintenance Rule system functions for the Unit 1 Dry Fuel Storage System and is documented in the Maintenance Rule data base for that system. The system function of "Providing confinement and structural support for irradiated fuel during storage and transfer" and performance criteria of "No functional failures which impact the integrity of the MSB pressure boundary" would document any functional failures during the handling of the MSB by the turbine building crane.

To provide overlap of all maintenance rule activities associated with the Turbine Building cranes, the Turbine Building System performance criteria was enhanced to include the handling of safety related equipment. The new performance criteria now reads, "Less than 2 functional failures per operating cycle of structures or components in the TB system which result in a Post Trip Transient Review or damage to safety related equipment". This would encompass the lifting and transporting of the MSB or any other safety related equipment.

Unit 2 TBS Turbine Building Sump Scoping

During the Maintenance Rule Baseline Inspection a question arose concerning the scoping of the Unit 2 TBS (Turbine Building Sump System). During the system engineering review of the 2TBS components several backflow preventers were identified between the sump and the EFW pump rooms. A condition report ANO-C-1998-17 was written to document failing to include the 2TBS under the scope of the maintenance rule. Action item #1 to this condition report will evaluate the condition, determine the cause, and issue necessary corrective actions. Other drain systems for both units will be reviewed to ensure no other maintenance rule scoping or missed functions exist. Addition actions to develop performance criteria and evaluate past performance for (a)(1) or (a)(2) classification will be completed.

Performance Monitoring of CVCS Charging Pumps

Concern:

A concern was developed as to whether the System Engineer was performing unavailability monitoring of the CVCS charging pumps. The concern also included questions about what is the specific unavailability performance criteria.

Position:

ANO monitors the availability of the CVCS charging pumps to a criteria of >95%. ANO also monitors the CVCS charging pumps performance by monitoring the probability of successful start and the probability of successful run. Availability, start and run reliability data has been collected on the CVCS charging pumps since 1992. ANO's conditional probability monitoring of the CVCS charging pumps is an acceptable method to monitor the overall probability of the system to perform it's mission. Current data indicates availability on all three pumps has exceeded 95% since 1995.

CVCS Maintenance Rule Data Base
A review was performed of the CVCS Maintenance Rule Data Base. Although the "bullet" system performance criteria section of the Maintenance Rule Data base does not note a specific availability criteria for the CVCS pumps, the bullet criteria section contains charging pump conditional probability criteria. Conditional probability monitoring for the charging pumps consists of monitoring the standby availability, the start probability and the run probability for each charging pump. The data to support all three of these parameters are routinely maintained by the system engineer. Up to date availability curves for all three pumps are available on the Maintenance Rule Data Base (Big Red Q - also see attachment). Availability data for the three charging pumps have been collected and available since 1992.

Included in the bases section of the Maintenance Rule Data Base is a system performance criteria bases section. Included in the text, there is clear reference to the requirement that the all three charging pumps must maintain a standby availability of >95%. The specific wording is: *"The charging pumps are monitored for starts, stops, failures and availability to calculate the conditional probability of the pumps. A performance criteria of 86% conditional probability was chosen. Conditional probability of 86% is based on maintaining an availability, start probability, and run probability of >95%. Conditional probability is these three factors multiplied (i.e. (.95) (.95) (.95) = .857)"*

Automatic Flags of Unavailability exceeding 95%
Additionally, a feature of the Maintenance Rule Data Base (Big Red Q) is that for risk significant systems, availability monitoring is automatically monitored when data is input into the Maintenance Rule Data Base's availability files. The feature would have

indicators of yellow "flags" (within the available hours for maintenance box for each of the charging pumps) when the unavailability (100% - availability) criteria exceeds 50% of unavailability criteria on a 12 month rolling scale. Likewise, a red flag indicates when the unavailability criteria is exceeded. This screen is routinely monitored by System Engineers, Maintenance Rule Coordinators, Supervisors and System Engineer Managers. Also, the Operation Liaison (as a tool for planning to take equipment out of service.) routinely reviews the screen. Therefore, if the availability of the charging pumps is approaching the 95% criteria, it would be questioned and appropriate action would be initiated. This online monitoring of availability also supports the above stated position that ANO criteria for availability is 95%.

Charging Pump Performance exceeds 95% Unavailability Criteria
It should be pointed out that the performance of the charging pumps has improved significantly from the performance in the early 1990s. All three of the charging pumps have been better than the overall conditional probability criteria of >86% since 1992. Additionally, all three of the charging pumps have been better than the 95% availability criteria since September of 1995. Attached are curves which show these improvements.

CVCS System not included in the ANO 2 PRA
It is extremely unlikely that the CVCS will ever be called upon to perform the primary function of reactivity control. The normal system used for reactivity control (control rod drives) has been demonstrated to be extremely effective in performing the function of reactivity control. Because the Anticipated Transient Without Scram (ATWS) event is extremely unlikely and because the plant thermohydraulic response to an ATWS is unique, the ANO-2 PRA used a scoping approach to assess the risk associated with an ATWS event. Consequently, the modeling of the CVCS function to provide emergency reactivity control in the ANO-2 ATWS scoping analysis was considered inappropriate for use in establishing Maintenance Rule performance criteria for the CVCS. Thus, for the purposes of the Maintenance Rule, the CVCS was not included in the ANO-2 PRA

Although not included in the ANO 2 Probability Risk Assessment, CVCS is considered by the Maintenance Rule Expert Panel as an important system. Because of this, CVCS has been designated as a Maintenance Rule risk significant system. However, because the system is not included in the PRA, the availability criteria of the system is only based on engineering judgment and is commensurate with safety. As stated within the bases section of the Maintenance Rule Data Base, ANO has selected the criteria of 95% availability as the criteria along with 95% probability of starts and 95% probability of runs. This criteria is consistent with the guidance provided in NRC Maintenance Rule Statement of Considerations, Backfit Analysis which imply that the licensee is responsible for establishing performance criteria.

Conditional Probability Monitoring will suited for monitoring CVCS Performance
The conditional probability monitoring techniques in place since the early 1990s with the CVCS system on ANO-2 is an acceptable method to monitor the performance of the charging pumps. Following a valid SIAS, the running charging pump will continue to run

but will swap suction to the Boric Acid Makeup Tanks. The idle charging pumps will receive a signal to start and will do so if possible and will draw from the Boric Acid Makeup Tanks. For successful operation, each of the idle pumps must satisfy three conditions. The first condition is that the idle charging pump must be operable (i.e., it must be in a condition where it is possible to start the pumps); Standby Availability is the measure of the fraction of time it is operable in this standby state. The next condition is that the idle pump must start; its Probability of Start is the measure that it will successfully start on demand. The last condition is that the idle pump must run for some defined mission time; its Probability of Run is the measure that it will successfully complete its mission. . All three conditions must be successful in order for the idle pumps to perform their mission, which is to inject boric acid into the reactor in order to control the reactivity. The three conditions are multiplied together to determine the overall Conditional Probability of success of each charging pump following a valid SIAS. That is, conditional probability is a combined term identifying the probability that the equipment is available, it will start, and it will run for the mission time.

This criteria was established with the ultimate objective of achieving an appropriate balance of reliability and availability.

Maintenance Rule Data Base criteria changed to avoid potential confusion
It is recognized that as an enhancement, the 95% availability monitoring criteria (which is clearly contained in the bases of the System Performance Criteria) should be moved up as a "bullet" system performance criteria. Likewise, it should be clearly reflected in the Maintenance Rule Data Base Risk Significant bases document. These enhancement changes have been performed and are attached, highlighting the changes.

Conclusion
The above provides evidence that ANO has been monitoring the availability of the all three of the CVCS charging pumps since 1992. ANO has also been monitoring the conditional probability of the pumps to start and run to the completion of their missions since 1992. Conditional probability is a combined term identifying the probability that the equipment is available, it will start, and it will run for the mission time. Conditional probability monitoring is considered an acceptible method to monitor overall performance of the CVCS system. The ANO Maintenance Rule data base has automatic flags which will indicate exceedance of availability criteria. Charging Pump performance over the last 3 years has been excellent, greater than 95% availability criteria on all three pumps. Although the CVCS system is not included in the PSA, ANO has elected to designate it as a Risk Significant system. An enhancement has been made to the Maintenance Rule Data Base to help insure that availability is being monitored against a criteria.

Basis for Unit 2 Main Steam Safety Valve (a)(1) Goals

A concern was identified during the NRC baseline inspection with respect to the goals established for Unit 2 MSSVs not meeting the intent of the rule. The goals were set above the acceptable technical specification limits.

The intended function of the MSSVs is to function as a group to provided adequate overpressure protection. A system level performance criteria to monitor this is established as "No failures of the MSSVs as a group to provide S/G overpressure protection during a cycle." Since this criteria alone is not predictive in nature to provide early warning of a loss of the key function, additional component level performance criteria was established to monitor individual valve performance with respect to lift setpoint tolerances. It is important to note that any individual valve or valves failing to lift within the prescribed tolerances does not necessarily result in the loss of the key system function. As such, utilizing industry experience, a failure rate of individual MSSVs was determined to provide a reasonable confidence that the key system function is maintained.

The MSSVs were placed in the (a)(1) category in June of 1996 based upon five MSSVs failing to meet MR performance criteria for failing setpoint testing in 2R11. The goals were established to reduce the 50% failure rate of valves exceeding setpoint tolerances at ANO to a rate consistent with industry operating experience. Actions were issued to determine acceptable performance and failure rates for MSSVs based on industry experience. The ANO System Engineering Desk Guide, Attachment 6, "Guidance for Establishing Goals" states that goals are established to be a measure of the effectiveness of (a)(1) corrective action plan, should utilize industry-wide operating experience, should be specific to the equipment failures, should be trendable and predictable, should bound current performance, and should reinforce the ultimate objective of achieving acceptable performance until performance is within the performance criteria.

Per 10CFR50.65, paragraph (a)(1), the licensee shall monitor the performance of SSCs against licensee established goals in a manner to provide reasonable assurance that the SSC are capable of fulfilling their intended function. Such goals shall be established commensurate with safety and, where practical take into account industry-wide operating experience. When performance does not meet established goals, appropriate corrective actions shall be taken.

Per Statements of consideration for the Maintenance Rule, the intention of paragraph (a)(1) is that the licensee establish a monitoring regime which is sufficient in scope to assure intended safety, accident mitigation and transient mitigation system functions can be performed. Where failures are likely to cause loss of an intended function, monitoring should be predictive in nature, providing early warning of degradation. Monitoring can be performance oriented (such as monitoring reliability and availability), condition-oriented (parameter trending), or both. Goals should be established commensurate with safety significance. Where available, the assumptions in and results of probabilistic risk assessments (PRAs) or individual plant examinations should be considered when establishing goals.

Per NUMARC 93-01, Rev 2, Section 9.4 Goal Setting and Monitoring: Goals are established to bring about necessary improvements in performance. When establishing goals, a utility should consider industry indicators, industry codes and standards, failure rates, and performance related data. The assumptions of IPEs/PRAs should be considered when establishing goals. In some cases the utility may elect to establish thresholds which would provide indication of improved performance toward the ultimate goal. Component level goals may need to be established when necessary based upon the component's contribution to the system not meeting its performance criteria.

<u>ANO MSSV Capability of Fulfilling Intended Safety Function</u>

Nuclear Engineering Design performs an evaluation of the safety significance of any as-found MSSV setpoints outside the technical specification limits at ANO. These evaluations have always determined that sufficient relief capacity was available to ensure the primary and secondary design limits and ECCS performance criteria were not violated. A maintenance rule performance criteria has been established for the Main Steam System of "NO functional failures of the MSSVs as a group to provide steam generator over pressure protection during a cycle." This criteria is established to ensure the intended function of the MSSVs is maintained.

To provide a more predictive monitoring method, giving early warning of MSSV degradation, a performance criteria of "Less than 3 functional failures of the MSSVs tested failing to lift within +/-3% during MSSV testing per operating cycle" has also been established. This is based upon industry-wide operating experience and the ANO specific valve design. Failure to meet this criteria has resulted in the MSSVs remaining in the (a)(1) category, even though the high lift setpoint problems have never resulted in the failure of the MSSVs as a group to perform their intended safety function.

Industry Experience on MSSVs

Safety and Relief valve setpoint problems are not unique to ANO. This is an industry-wide problem which has not been fully resolved to date. ANO has utilized industry experience by reviewing past experience documents, participating in industry meeting and training events, user group participation, extensive valve testing programs at WYLE and NWS Laboratories, new design development and testing with Crosby, and shared experience through contact with other utility engineers.

Per EPRI/NMAC Safety and Relief Valve Testing and Maintenance Guide (TR-105872s) "The predominant failure mode for all valve types is lifting outside of the desired range. The predominant failure mode for all safety valves is MSSVs lifting higher than the setpoint value. Most of these failures are outside the +/- 1% allowable but within the +/- 3% vendor design tolerance. An industry survey found that 50% of those responding had requested relief from technical specifications of as-found within +/-1% tolerance. The ASME/ANSI OM-1987 Part 1 allowance of +/-3% as-found tolerance is recommended."

ANO has completed and received NRC approval of the necessary support calculations for widening our MSSV tolerance to the industry recommended +/-3% value. The technical specification change documentation is being assembled for submittal this year. The new technical specification limits should be in place prior to the next testing interval for ANO-2 in 1999. Action item #5 to CR 2-97-0152 documents development and implementation of the technical specification change as part of our corrective action plan for MSSV lift problems. This technical specification change is being sought based upon industry-wide operation experience.

Unit 2 PSA Modeling of the MSSVs

The Unit 2 PSA was considered when establishing goals for the Main Steam System. The PSA models failure of the MSSVs to reseat after lifting and the impact to the RCS system. The lifting of the MSSVs within the technical specification or ASME Code limits is not addressed.

The Unit 2 MSSV Goals were established based on the following:

Based on NUMARC 93-01 Rev 2 Section 9.4, component level goals were determined to be necessary for the MS system. This section of NUMARC 93-01 states that component level goals should be established based upon the components contribution to a system not meeting its performance criteria. Individual MSSV out of tolerance conditions have never caused inadequate overpressure protection of the S/Gs at ANO (i.e. - has never resulted in a loss of the key system function.) The goals for individual MSSV setpoints were established based on achieving an acceptable failure rate for individual valves prior to dispositioning the MS system to (a)(2). This setpoint failure rate was established consistent with industry operating experience. We believe that these goals, as well as the performance criteria, provide reasonable assurance that the key system function of providing adequate overpressure protection for the S/Gs is maintained.

The corrective action plan for Unit 2 MSSVs (Reference CR 2-96-0081) includes changing the technical specification requirements as recommended by industry experience. The maintenance rule (a)(1) cause determination process has properly identified our MSSVs as not performing adequately with respect to industry standards and it has also identified that our technical specification limits are not reasonable and should be corrected. It would be unreasonable to set goals to monitor the effectiveness of our corrective actions based soley upon existing technical specification limits. The ANO System Engineering Desk Guide, Section 6.4 "Dispositioning SSCs from (a)(2) to (a)(1)" states: A CR action to monitor to the goal should be assigned with the due date consistent with the completion of the action plan and monitoring period. A TS change is expected prior to the 2R13 refueling outage in 1999 when the MSSVs will be tested next.

The corrective action plan for the Unit 2 MSSVs includes:

- Procedure changes in the testing methods
- Implementing a PM for trending valve performance
- Implementing flexidisc modifications of the MSSVs to reduce leakage during testing
- Unit 2 Technical Specification change from +1/-3% to +/-3% as-found acceptance criteria.
- Procedure improvements in off-site testing and maintenance procedures
- Re-evaluation of industry experience on MSSVs
- Evaluate changes to the MSSVs to enhance lift setting repeatability and high first lift issues

Since not all of the corrective actions will be complete until 2R14, the following goals were established:

Short Term Goals

All MSSVs tested in 2R13 will lift below +5% of setpoint and,

Less than 4 MSSVs will lift above +3% of setpoint.

These goals provide a measure that indicates improved performance of the MSSVs compared to past performance. These goals are strictly to measure the effectiveness of the corrective actions performed during 2R12 and to show that the MSSVs are moving in a direction toward an acceptable level of performance. They would not indicate that the MSSVs are ready to return to an (a)(2) status.

Long Term Goals

All MSSVs tested in 2R14 will lift below +4% of setpoint and,

Less than 3 MSSVs will lift above +3% of setpoint.

These goals provide a measure that indicates further improved performance of the MSSVs compared to the goals established for 2R13. Seven of ten MSSVs, at a minimum, will have been tested by 2R14. This should provide adequate demonstration of the effectiveness of corrective actions and improved valve performance consistent with the (a)(2) performance criteria. The MSSVs performance can then be assessed at that time and the MSSVs reclassified to (a)(2).

The current (a)(2) performance criteria is:

No failures of the MSSVs as a group to provide S/G over pressure protection during a cycle.and

Less than 3 functional failures of the MSSVs tested failing to lift within the ASME Code / TS requirement of +/-3% during MSSV testing per operating cycle.

This (a)(2) performance criteria is less restrictive than the (a)(1) goals established above. When the MSSVs meet the long term goals, the performance will be within industry-wide operating experience, and will demonstrate adequate maintenance is being performed on the MSSVs to ensure they will perform their intended function.

The existing goals and performance criteria fully satisfy the maintenance rule requirements for effective monitoring of maintenance with respect to MSSV performance. The goals and performance criteria ensure the safety related function of the MSSVs as a group are maintained, based upon industry-wide operating experience, are predictive in nature, monitor the effectiveness of our corrective action plan, and show demonstrated improving performance toward the MSSV performance criteria.

UNIT 1 INSTRUMENT AIR SYSTEM

The ANO Unit 1 Instrument Air system is monitored at the plant level versus the component or compressor level for maintenance rule purposes. The IA system is normally operating and has low safety significance (not risk significant). The system has been reviewed against the three screening criteria for the PSA model results and found to be non risk significant. It is within the scope of the maintenance rule as a trip initiator and for EOP significance to support air operated components needed to maintain condenser vacuum during an SGTR event. The plant level performance monitoring criteria are in compliance with the requirements of Reg Guide 1.160 Rev.2 and NUMARC 93-01 Rev.2 for monitoring the effectiveness of maintenance at nuclear power plants. The Unit 1 IA performance criteria listed in the site's maintenance rule data base are as follows:

"1. Less than 3 functional failures per 2 operating cycles which result in a Post Trip Transient Review"

"2. Less than 3 functional failures per cycle in other maintenance rule systems caused by Instrument Air."

Performance criteria #1 monitors plant trips and any transients which meet the Post Trip Transient Review procedure threshold. The performance criteria basis for criteria #2 is described in the maintenance rule data base as follows:

"Performance criteria #2 monitors failures of air operated components caused by Instrument Air which result in functional failures of other maintenance rule systems. An air operated valve or other component which is classified in another system may fail to control or perform as required due to IA problems such as contaminants (debris, oil, water, etc.) or localized loss of pressure which may not cause a unit trip or transient. This condition would result in a functional failure of the component's system and with this criteria will also be tracked as an IA system failure, provided the cause of the problem is determined to be IA related. This criteria prevents instrument air caused failures from being tracked in a number of other systems, but not cumulatively tracked by IA. Due to the relatively large population of IA supplied components which could be potentially affected, allowing two failures per cycle is considered acceptable (unless a plant transient is involved, in which case criteria #1 applies). This criteria also encompasses failure of air operated components which are needed to maintain condenser vacuum (again, unless a plant transient is involved, in which case criteria #1 applies)."

Performance criteria #1 is established at the plant level of monitoring since it is associated with tracking a plant level system function, in this case, plant trips. This level of monitoring for a normally operating, low safety significance system is supported by the following references:

Regulatory Guide 1.160, Rev. 2, MONITORING THE EFFECTIVENESS OF MAINTENANCE AT NUCLEAR POWER PLANTS

Page 5 states, "Except as noted in the Regulatory Position of this guide, normally operating SSCs with low safety significance may be monitored through plant-level performance criteria, including unplanned automatic scrams, safety system actuations, or unplanned capability loss factors." (NOTE: no exceptions in the regulatory position portion of the guide apply to this system.)

Page 14 section 1.7.1 states, "For all SSCs that are being monitored using plant-level performance criteria (i.e., normally operating SSCs of low safety significance), the NRC staff's position is that a cause determination is required whenever any of these performance criteria are exceeded (failed) in order to determine which SSC caused the criterion to be exceeded or whether the failure was a repetitive MPFF."

Page 15 section 1.7.3 states, "Licensees must ensure that the plant-level criteria established do effectively monitor the maintenance performance of the normally operating SSCs of low safety significance, or they should establish SSC-specific performance criteria or goals or use condition monitoring." An example follows listing two systems which are within the scope of the rule, normally operating and of low safety significance, but which cannot realistically cause scrams, unplanned capability loss factor, or safety system actuation. For this case "additional plant-level performance criteria or system-specific performance criteria must be established."

NUMARC 93-01, Rev. 2, INDUSTRY GUIDELINE FOR MONITORING THE EFFECTIVENESS OF MAINTENANCE AT NUCLEAR POWER PLANTS

Page 21, section 9.3.2 states, "Plant level performance criteria are established for all remaining non-risk significant normally operating SSCs." Further, "Remaining non-risk significant SSCs (those normally operating) are addressed under (a)(2) and performance is monitored against plant level criteria."

Page 22 includes, "If the function of the scoped system is lost and it causes a scram, the cause determination has to be completed to determine if it is an MPFF." Later in this paragraph, "However, failures that do not cause a scram or actuation of a safety system do not have to be tracked." An example follows which describes a "Plant B" with three 50% capacity circulating water pumps. One pump trips, but does not result in a scram. The following statements are then provided, "Plant B may elect to do a cause determination but it is not required because a plant scram did not occur. In addition, if Plant B experiences a second failure of the same type several weeks later and the unit does not scram, it is not a repetitive failure. Neither failure on Plant B has to be addressed under the maintenance rule because (1) the failure that occurred did not cause a loss of the function (i.e., total loss of cooling water that causes a scram) that scoped it within the maintenance rule and (2) the plant level performance criteria (i.e., unplanned automatic reactor scrams per 7000 hours critical) was not affected."

NRC Policy Issue, SECY-97-055

Page 5 states, "SSCs that are of low safety significance and normally operating may be monitored at the plant level:"

Page 13 states, "As previously noted, normally operating SSCs of low safety significance are generally monitored at the plant level." Clarifying comments follow relating that both automatic scrams and manual scrams initiated in anticipation of an automatic scram are to be counted when using plant level monitoring. Also stated, "Given that one of the principal reasons for developing a maintenance rule was the number of reactor scrams (both manual and automatic) caused by failures in the balance of plant, the NRC staff position has been that licensees should monitor all unplanned scrams in order to assess the effectiveness of their preventive maintenance for those SSCs monitored at the plant level."

Statement of Considerations for the Maintenance Rule, Federal Register Vol. 56, No. 132 / 31306.

Additional Guidance for Scope of Monitoring states, "The extent of monitoring may vary from system to system depending upon system importance to plant risk." Also, "Rather than monitoring the many SSCs which could cause plant scrams, the licensee may choose to establish a performance indicator for unplanned automatic scrams and, where scrams due to equipment failures have been problematic or where such scrams are anticipated, choose to monitor those initiators most likely to cause scrams."

NRC Inspection Manual, Inspection Procedure 62706, Maintenance Rule

Page 8 states, "For low safety significant normally operating systems (i.e., those not used in standby service), monitoring indicators of system reliability and availability alone may be sufficient. Low safety significant normally operating systems could also be monitored using plant level performance criteria. For example the licensee may choose to monitor unplanned scrams or plant capacity factor as an indirect means of monitoring performance of low safety significant normally operating SSCs. Additional guidance on acceptable methods of monitoring is contained in Section 9.4.2 of NUMARC 93-01."

Page 12 section 3.02.a.1 states, "NUMARC 93-01 also recommends that specific performance criteria be established for all high safety significant SSCs and for low safety significant SSCs that are in standby (not normally operating) mode. Plant-level performance criteria could be established for all remaining low safety significant, normally operating SSCs."

The guidance provided by NUMARC 93-01 Rev.2 was developed in conjunction with comments from the NRC staff. "Together, NUMARC 93-01 and RG 1.160 provide sufficient guidance to licensees to develop a program that can comply with the requirements of the maintenance rule, " as stated in the NRC Policy Issue SECY-97-055 (dated March 4, 1997). No exclusions or clarifications to the above quoted sections of NUMARC 93-01 were found in RG 1.160 or Policy Issue SECY-97-055 which would lead us to believe that the plant level performance criteria established for the Unit 1 IA system are inappropriate or contradictory to the requirements listed in them.

The selection of plant level monitoring of transients/trips for a system function of "trip initiator" is viewed as appropriate and in compliance with the maintenance rule guidelines provided. The presence of multiple compressors within the IA system and of system crossties which increase system reliability does not make the established criteria inappropriate for monitoring the effectiveness of maintenance to ensure the system is capable of performing the plant level function of trip reduction.

The IA system monitoring does not rely solely upon plant level criteria. Monitoring includes functional failures called in any other maintenance rule system which are the result of IA problems. This criteria does not rely upon plant trip or transient conditions to result in a functional failure classification.

The maintenance rule performance criteria do not directly monitor the individual instrument air compressors, dryers, filters, valves or other components. The criteria monitor the ability of a non-risk significant, normally operating support system to provide it's intended support function. This is believed to be the intent of the maintenance rule monitoring for such a system.

Since the Instrument Air system is normally operating and is required to support power generation, additional monitoring and maintenance activities are performed which are not addressed directly by the maintenance rule program performance criteria. These activities include but are not limited to:

Operations:
Shiftly: Check oil levels, all compressors
- Blowdown receiver tank drains, dryer inlet, system filters (verifies traps working)
- Blowdown control line inlet and control filter to check for water
- Check local alarm panels
- Check filter dp's

Daily: Check idle C-28 separator pressure (for check valve leakage, and start interlock)

Weekly: C-28 Compressor Lead/Lag are swapped.
C-2A&B are run, load/unload and swapping are checked.
With C-2 running, check filter dp and aftercooler separator blowdown.
Monthly: Blowdown C-28 aftercooler fins to minimize dirt buildup.

Predictive Maintenance Engineering:
Vibration readings and lube oil analysis is performed every 3 months on the C-28A&B compressors and every 6 months on the C-2A&B compressors.

System Engineering:
Routine system walkdowns.
Cycle reports presented to plant management to discuss system issues and actions.

Maintenance:
Monthly checks are made at various points in the system for dew points and foreign material.
Preventive Maintenance tasks are performed routinely on the compressors, motors, dryers, instrumentation, filters, coolers, etc.

Significant improvements and modifications to the Instrument Air system have been made in recent years. These improvements have not been the result of the maintenance rule system classification or functional failure calls, but have instead been driven by the economics of plant operation and the related goal of minimizing trips and unplanned actuation of safety systems. The improvements were directed by both the site's condition report process to address previous system challenges and the identification of system needs by System Engineering, Operations, and Maintenance personnel. The following list of improvements is provided as an indication of the significance placed upon the IA system and the site's support of improving system performance and minimizing challenges to plant operation.

Unit 1 Instrument Air System Improvements During Past 5 Years:

New Compressors/Receiver/Dryers:
Two 100% capacity rotary screw air compressors were installed in 1993. A new receiver tank and two air dryer assemblies were also added with the compressors. Connection of the new compressors to the turbine building portion of the IA header reduced the risk of system failure related to a single flow path for all compressors. The new compressors significantly increased system capacity but experienced various startup problems, early component failures and vendor technical deficiencies. Approximately 2 years were

expended adjusting/tuning/repairing new compressors to achieve acceptable run reliability.

Copper Solder Joint NDE:
Several failures of copper solder joints occurred immediately prior to this 5 year time period. Corrective action response involved extensive x-ray scope of "critical" IA piping joints (supply headers and critical component supply piping) throughout the plant. Joints found with inadequate bonding were replaced.

Second Unit 1 / Unit 2 IA Crosstie:
A new IA system crosstie was installed between Unit 1 & 2. The ability of either unit to supply both units IA loads was successfully verified. Crosstie of the C-2A&B compressor discharge to the new M-14 & M-15 dryer sets was also added to reduce reliance of both C-2A&B on a single dryer, M-1.

New Unit 2 Compressors/Dryers:
New larger compressors were installed on Unit 2 with new dryers, filters, etc. Provides U2 with significant increased capacity and ability to supply both units with IA if required.

IA Piping Hanger Inspection/Repairs:
Maintenance program established to systematically inspect and repair IA hangers. Spans with inadequate supports are addressed as well as any instances copper piping found to be wearing or fretting at supports. Significant I&C maintenance efforts have also corrected high vibration connections such as to valve operators.

Startup Boiler Air Compressor Crosstie and Receiver Installation:
The startup boiler which included it's own compressor and air system was tied into the Unit 1 IA system. An additional receiver tank was installed for surge capacity. The startup boiler compressor is added to the IA system procedures as an available backup. This connection provides the 12th compressor available to supply air into the system (5-U1 IA, 2-U2 IA, 2-U1 BA, 2-U1 SA, & 1-U2 SA).

Improved Weld Process Established for Solder Joints:
As a corrective action associated with a 6/95 failure of a recently soldered header pipe, improvements were made to the welding processes for soldered connections.

Site Air Compressor Long Range Plan:
At the request of site plant mangers a condition report corrective action was issued to develop a long range integrated plan for compressors, dryers, etc.. This plan is scheduled for presentation Summer 1998 to maximize system flexibility and reliability.

SUMMARY:

In conclusion, the IA system includes plant level performance monitoring in keeping with the guidance provided in the referenced Reg. Guide and NUMARC documents for normally operating non-risk significant systems.

Molded Case Circuit Breaker Testing

The Maintenance Rule Inspection team cited the lack of testing certain molded case circuit breakers (MCCBs) in the 120 VAC system as a case of inadequate monitoring to demonstrate effective maintenance . More specifically, breakers in the 120 VAC power distribution system providing a Class 1E to non-Class 1E isolation function are not being periodically tested to demonstrate their fault isolation function.

ANO believes that adequate monitoring of the Class 1E to non-Class 1E isolation function currently exists in the 120 VAC system with respect to the Maintenance Rule. Specifically, this is addressed under the following four performance criteria in the 120 VAC system:

"No more than 2 functional failures per 2 cycles of a Y panel breaker needed for transient mitigation or 1E isolation."

"No more than 1 functional failure per 2 cycles resulting in the loss of a Y panel."

"No more than 1 functional failure per 2 cycles of an RS panel breaker when required by TS or SOPP."

"No more than 1 functional failure of RS panels per 3 cycles when required by TS or SOPP."

This monitoring includes both failure of a breaker to trip when required and spurious breaker trips. Failure of a breaker to provide Class 1E to non-Class 1E isolation would also result in de-energization of an entire panel. Therefore, two functional failures would actually be assigned upon an isolation failure of a Y panel breaker or an RS panel breaker. A total of 150 breakers are included under the above performance criteria. Therefore, the monitoring criteria is considered to be overly conservative.

Per paragraph a(2) of the 10CFR50.65 (Maintenance Rule), monitoring under paragraph a(1) of the rule is not required where it has been demonstrated that the performance or condition of a SSC is being effectively controlled through the performance of appropriate preventive maintenance, such that the SSC remains capable of performing its intended function. NUMARC 93-01, Rev. 2 has been endorsed by the NRC as an acceptable method for complying with the requirements of the Maintenance Rule. According to section 10.2.1 of NUMARC 93-01, Rev. 2, the trending of appropriate failures is considered to be an effective preventive maintenance monitoring method that is in compliance with the Maintenance Rule . Therefore, since ANO is monitoring the 1E isolation function of the 120 VAC system via failure trending, compliance with the Maintenance Rule has been demonstrated.

ANO does agree that preventive maintenance for MCCB breakers can be enhanced to include testing that demonstrates fault isolation capability. In fact, prior to the NRC A/E Inspection conducted in 1997 (documented in NRC Inspection Report 50-313/97-201) ANO had already identified the need for improved MCCB testing and subsequently committed to the NRC to establish a MCCB testing and/or replacement program via letter 1CAN099703 (URI 50-313/97201-14).

In that letter, ANO committed to develop and implement a limited scope ANO-1 reactor building penetration MCCB testing/replacement program during refueling outage 1R14 currently scheduled for the Spring of 1998. Furthermore, ANO committed to categorize remaining safety related MCCBs according to risk significance and to establish a testing or replacement program for those breakers by the end of 1998 for those considered risk significant. ANO-2 currently has a reactor building penetration breaker testing program but plans to enhance their program to include additional breakers that are considered to be risk significant. The existing Unit 2 test program has not identified a high failure rate of molded case circuit breaker isolation capability. In addition, time-overcurrent trip characteristics were tested on February 11, 1998 for six Unit 1 type 120 VAC breakers that had been purchased in 1974 and stored in the warehouse. The test results showed that all six breakers were able to trip in accordance with the manufacturer's curves.

Condition Report CR-ANO-C-1998-0028 has been issued to identify the MCCB testing concern and to initiate any corrective actions that are deemed necessary by the CR evaluation.

Unit 2 PASS Performance Criteria

Concern:

The current Performance Criteria of the Unit 2 PASS is "Less than 3 functional failures per cycle and no repeat failures per 2 cycles". A review of the testing frequency of the component monitored by that criteria revealed that 3 functional failures in 2 cycles would not be exceeded given the current testing frequency which is every 18 months. Only one component in the U2 PASS is under the scope of the Maintenance Rule, therefore, the criteria of no repeat failures would have detected unacceptable performance of the component in question. The component in question (Relay 94/8337-2) has had no failures, therefore, no Operability concerns exist.

Corrective Actions:

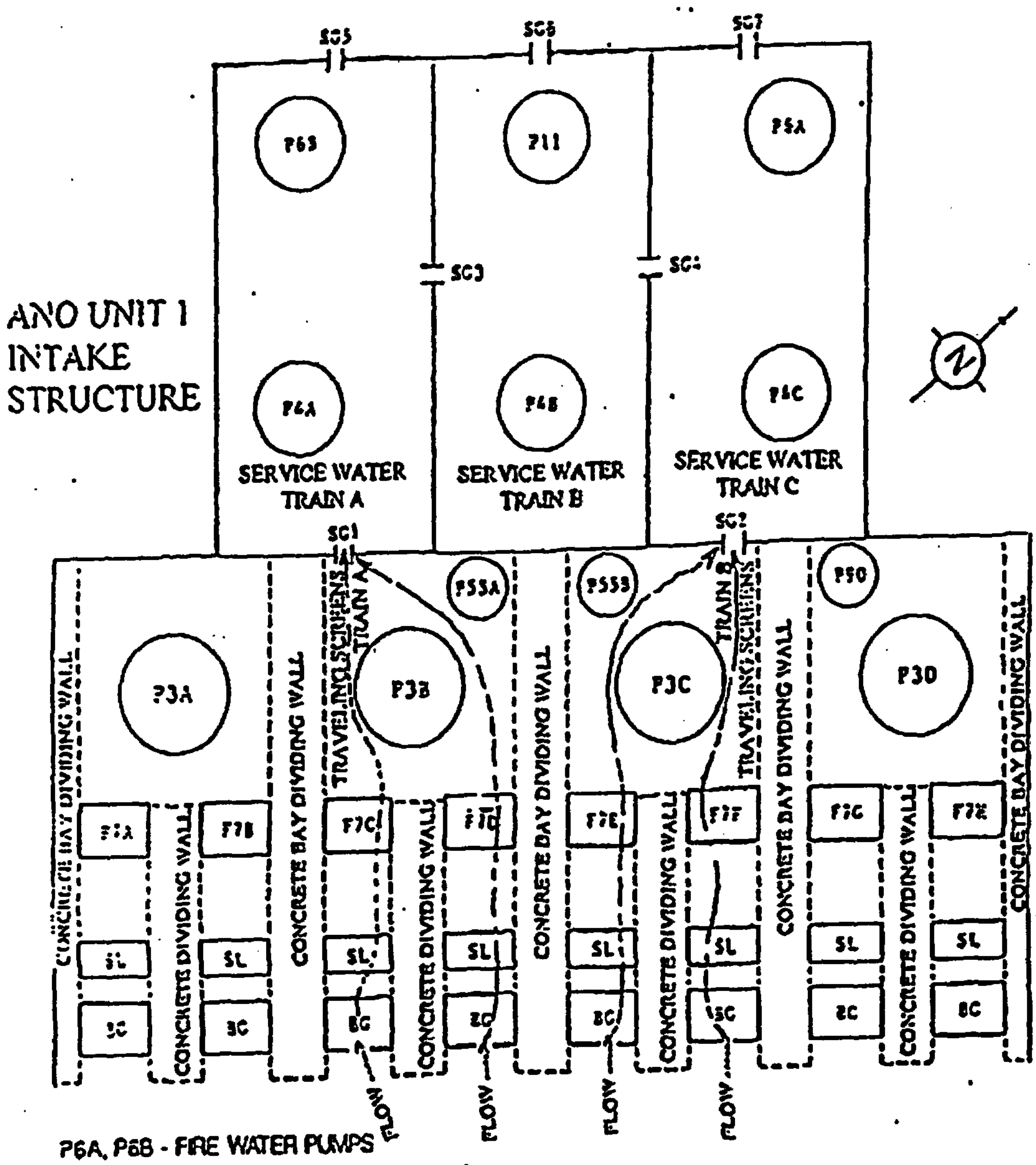
Although there is a good possibility that repeated failures on the relay would be considered as repetitive failures causing the system to be classified as a(1), is also recognized that it is possible that subsequent failures on the relay may be due to different causes which may not be considered as repetitive. Because of this potential concern, a condition report was issued to document the potential condition. The following corrective actions are to be performed to address the specific concerns on the PASS system noted above and to address any generic concerns with other Maintenance Rule systems.

- A revision to the current Performance Criteria for the Unit 2 PASS system to reflect a more realistic Performance Criteria (i.e. "Less than 2 functional failure per 2 cycles and no repeat failures per 2 cycles")
- A review of Unit 1 Maintenance Rule systems to verify that the current demand/testing frequency of systems/components are consistent with the established Performance Criteria.
- A review of Unit 2 Maintenance Rule systems to verify that the current demand/testing frequency of systems/components are consistent with the established Performance Criteria.

ENCLOSURE 10

ANO UNIT 1 INTAKE STRUCTURE

Response to ANO Maintenance Rule Inspection Follow-Up Action Request: Traveling Screen Availability Monitoring



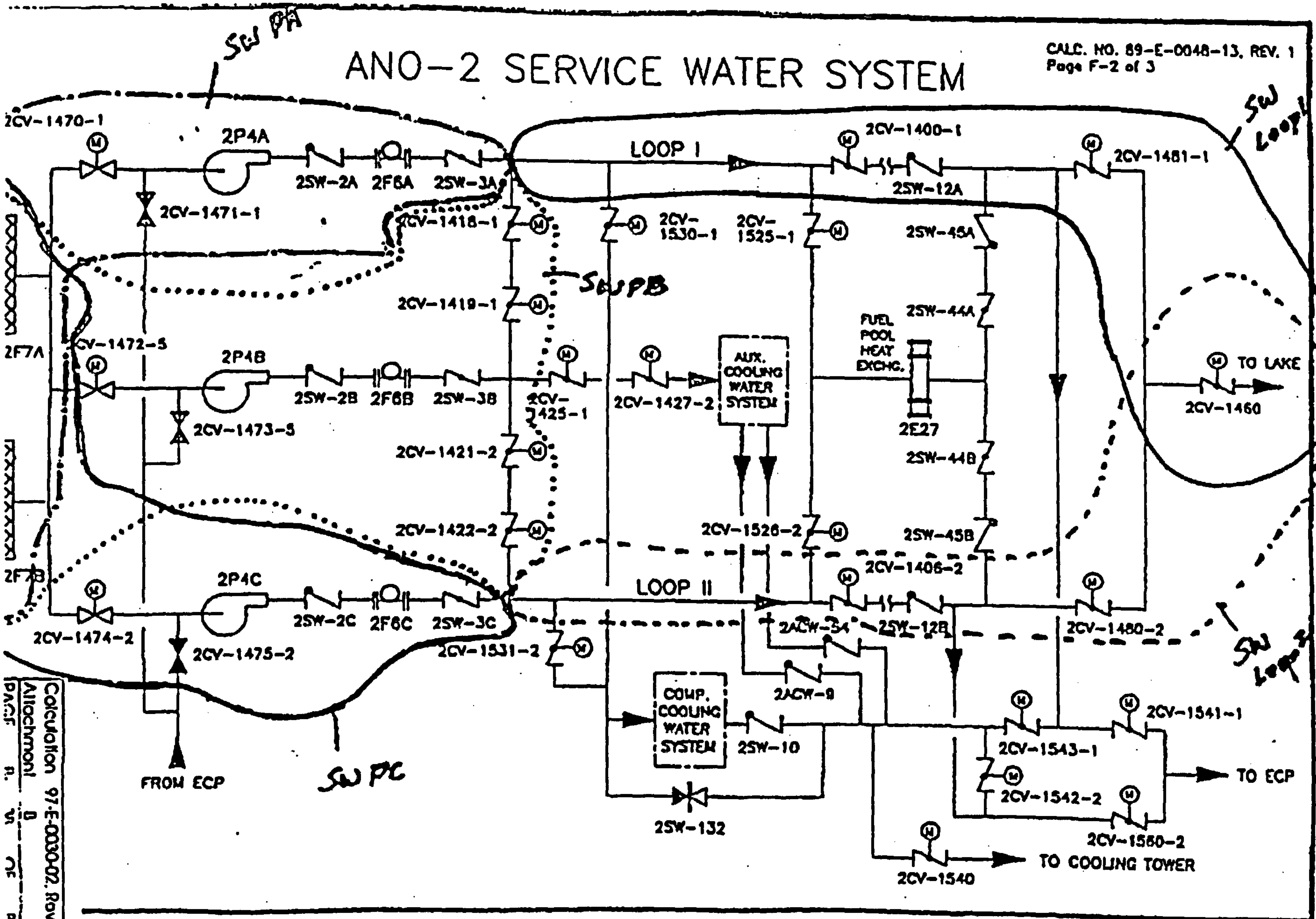
P6A, P6B - FIRE WATER PUMPS
P4A, P4B, P4C - SERVICE WATER PUMPS
P3A, P3B, P3C, P3D - CIRCULATING WATER PUMPS
P55A, P55B - SCREEN WASH PUMPS
P90 - CHLORINATION PUMP
F7A Thru F7H - TRAVELING SCREENS
SL's - STOP LOGS
BG's - BAR GATES
P11 - JOCKEY FIRE PUMP

ENCLOSURE 11

ANO-2 SERVICE WATER SYSTEM

ANO-2 SERVICE WATER SYSTEM

CALC. NO. 89-E-0048-13, REV. 1
Page F-2 of 3



Attachment B
Service Water

Calculation 97-E-0030-02, Rev. 0
Attachment B
PAGE 8 of 8

ENCLOSURE 12

PSA SYSTEM/TRAIN CUTSETS
RUN FAILURE RATES (24 HR. MISSION)

Attachment D
PSA System/Train Cutsets
Run Failure Rates (24 hr Mission)

1	LMM2XXP60B	MOTOR-DRIVEN PUMP 2P-60B FAILS TO PROVIDE FLOW		2.44E-03	2.44E-03	2.44E-03
2	LMM2BXOUTB	2E35-B OUTLET VALVES 2SI-4B OR 2SI-5B FAIL TO ALLOW FLOW		2.15E-04	2.15E-04	2.15E-04
3	LCD22212XR	125V DC BREAKER 72-2212 TRANSFERS OPEN	3.80E-06	3.60E+01	1.37E-04	1.37E-04
4	LMM2X50913	MANUAL VALVE 2SI-5091-3 NOT CLOSED		1.07E-04	1.07E-04	1.07E-04
5	LMM200SIIB	MANUAL VALVE 2SI-1B FAILS TO ALLOW FLOW		1.07E-04	1.07E-04	1.07E-04
6	DCD22404XR	DC BREAKER 72-2404 TRANSFERS OPEN	3.80E-06	2.40E+01	9.12E-05	9.12E-05
7	YMM2SWHEXB	INDEPENDENT FAILURES OF TRAIN B SDCHX SERVICE WATER SUPPLY		3.65E-05	3.65E-05	3.65E-05
8	LMM2CV5086	MOTOR-OPERATED VALVE 2CV-5086-2 FAILS TO PROVIDE FLOW		3.65E-05	3.65E-05	3.65E-05
9	LMM2CV5084	MOTOR-OPERATED VALVE 2CV-5084-1 FAILS TO PROVIDE FLOW		3.65E-05	3.65E-05	3.65E-05
10	LMM2CV5038	MOTOR-OPERATED VALVE 2CV-5038-1 FAILS TO PROVIDE FLOW		3.65E-05	3.65E-05	3.65E-05
11	LPT246232H	PRESSURE TRANSMITTER 2PS-4623-2 FAILS HIGH	1.49E-06	2.40E+01	3.58E-05	3.58E-05
12	LPT246231H	PRESSURE TRANSMITTER 2PS-4623-1 FAILS HIGH	1.49E-06	2.40E+01	3.58E-05	3.58E-05
13	LCB2062E5R	AC BREAKER 52-62E5 TO 2CV-5086-2 TRANSFERS OPEN	8.06E-07	3.60E+01	2.90E-05	2.90E-05
14	LCB2051L2R	AC BREAKER 52-51L2 TO 2CV-5084-2 TRANSFERS OPEN	8.06E-07	3.60E+01	2.90E-05	2.90E-05
15	LCB2052E5R	AC BREAKER 52-52E5 TO 2CV-5038-1 TRANSFERS OPEN	8.06E-07	3.60E+01	2.90E-05	2.90E-05
16	LCB2062C2R	AC BREAKER 52-62C2 TO 2CV-5086-2 TRANSFERS OPEN	8.06E-07	3.60E+01	2.90E-05	2.90E-05
17	LCB2051G2R	AC BREAKER 52-51G2 TO 2CV-5084-1 TRANSFERS OPEN	8.06E-07	3.60E+01	2.90E-05	2.90E-05
18	LMM2R46232	RELAY 63X1-4623-2 FAILS		9.46E-06	9.46E-06	9.46E-06
19	LMM2R46231	RELAY 63X1-4623-1 FAILS		9.46E-06	9.46E-06	9.46E-06
20	AAA002	RECIRCULATION MODE FLAG		1.00E+00	1.00E+00	7.90E-08
	LMM2VUC1DF	INDEP FAILURES OF SHUTDOWN HX ROOM COOLER 2VUC-1D		2.81E-04	2.81E-04	
	LMM2VUC1EF	INDEP FAILURES OF SHUTDOWN HX ROOM COOLER 2VUC-1E		2.81E-04	2.81E-04	

Cutsets with Descriptions Report
MR-SW-A-P = 3.45E-03
C:\MRULE\RUNE\MRSWPA.CUT 8/14/97 1:13 PM

#	Inputs	Description	Rate	Exposure	Event Prob	Probability
1	SMM2SE2P4A	SW SEGMENT 2P4A MODULE		3.26E-03	3.26E-03	3.26E-03
2	STF2SCRNSP	ANO-2 TRAVELING SCRNS PLUGGED	4.07E-06	2.40E+01	9.77E-05	9.77E-05
3	DCD22304XR	DC BREAKER 72-2304 TRANSFERS OPEN	3.80E-06	2.40E+01	9.12E-05	9.12E-05

Cutsets with Descriptions Report
MR-SW-B-P = 3.52E-03
C:\MRULE\RUNE\MRSWPB.CUT 8/14/97 1:14 PM

#	Inputs	Description	Rate	Exposure	Event Prob	Probability
1	SMM22P4BXF	SW PUMP 2P4B MODULE (PASSIVE FAULTS)		2.44E-03	2.44E-03	2.44E-03
2	SMM2SE2P4B	SW SEGMENT 2P4B MODULE		8.23E-04	8.23E-04	8.23E-04
3	STF2SCRNSP	ANO-2 TRAVELING SCRNS PLUGGED	4.07E-06	2.40E+01	9.77E-05	9.77E-05
4	DCD22304XR	DC BREAKER 72-2304 TRANSFERS OPEN	3.80E-06	2.40E+01	9.12E-05	9.12E-05
5	SMM2XOVERF	ANO-2 SW X-OVER VLVS 1418&19 CLOSE MODULE		7.30E-05	7.30E-05	7.30E-05

Prepared by M. Lloyd
Checked by R.W. Clark